Metals Review

THE NEWS DIGEST MAGAZINE

Published by the American Society for Metals

Volume XXIII • No. 3 March • 1930

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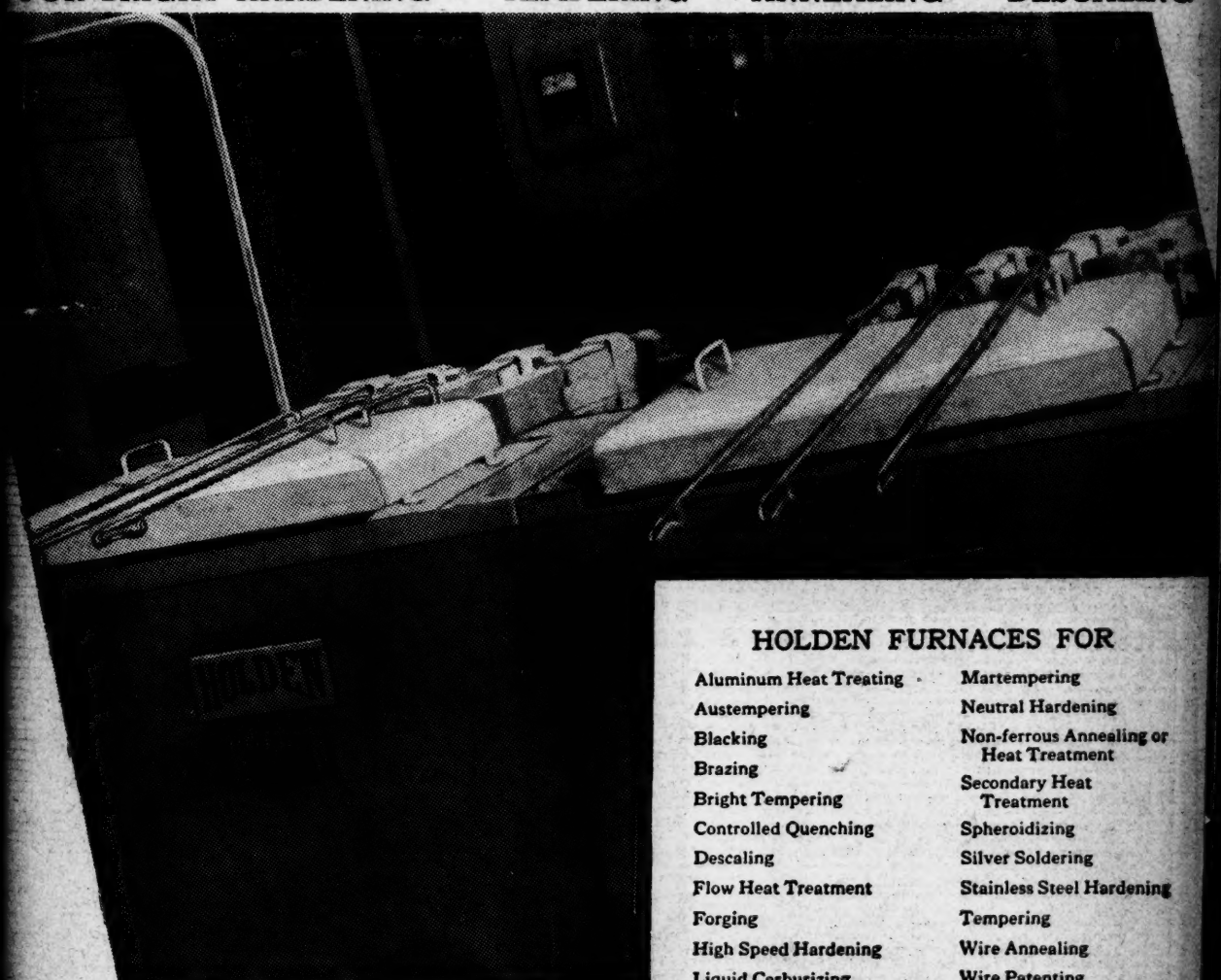

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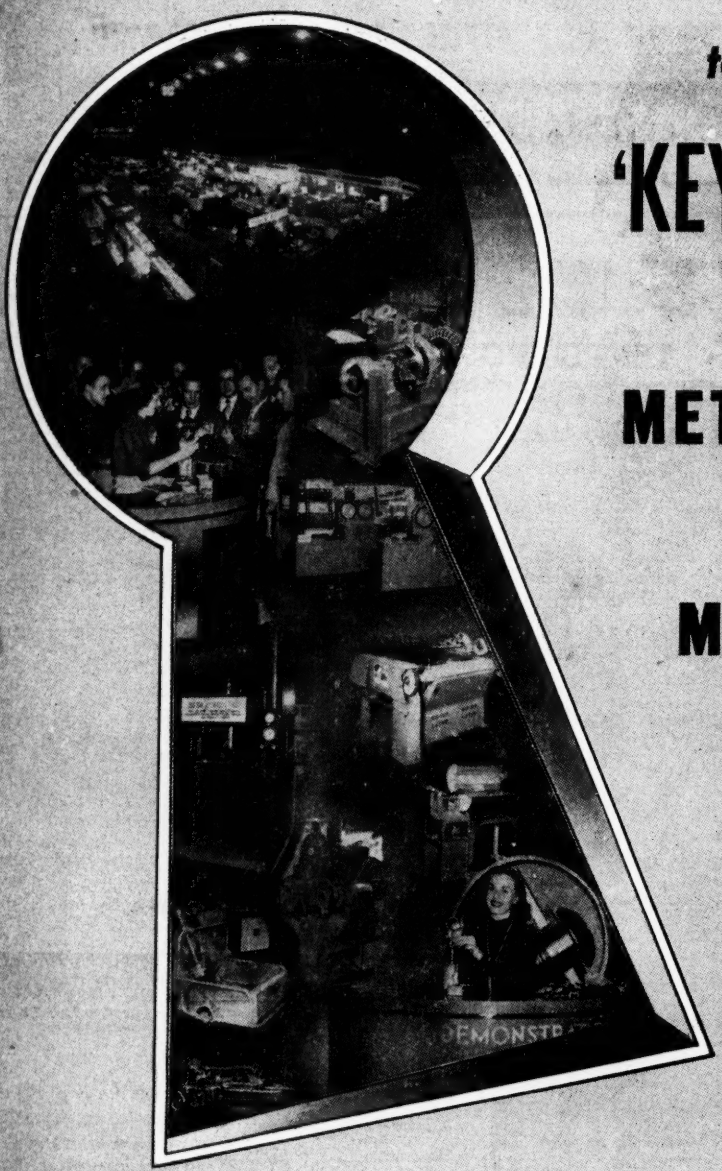

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Metals Review

THE NEWS DIGEST MAGAZINE

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VOLUME XXIII, No. 3 MARCH, 1950

A.S.M. REVIEW OF METAL LITERATURE

New Classification System

Starting in 1950, a new classification system has been adopted for the ASM Review of Metal Literature. It is based on the ASM-SLA Classification of Metallurgical Literature, described in the February issue of Metals Review. *Below are the titles of the main sections of the classification, together with the page numbers in this issue. The scope of each of these sections was explained in the classification outline published in February.*

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Akron Chapter Educational Course Draws 447

Success Attributed to Combination of Factors

With a total membership of 152, Akron Chapter A.S.M. has chalked up the remarkable enrollment figure of 447 for its educational lecture course currently in progress. This phenomenal enrollment and unprecedented popularity of the course can be traced to a combination of factors, according to L. W. Hudson of Goodyear Aircraft Corp., chairman of the Educational Committee.

"We anticipated an enrollment of about 50," said Mr. Hudson, "and when one of our members ventured to predict that we might enroll as many as 100, we all thought he was being highly optimistic!"

The course is entitled "Practical Metallurgy" and is fundamental and elementary in nature, according to Mr. Hudson. It is intended primarily for the shopman — the designer, draftsman and machinist, as well as the heat treater, the laboratory apprentice and the junior metallurgist. Thus, it has the widest kind of appeal in an industrial territory such as Akron and neighboring cities.

Low cost is one of the attractions of the course, Mr. Hudson also pointed out. The registration fee was $1.80 if received before Jan. 14, and $2.00 after that date. If a registrant attends six of the seven classes, the chapter will refund $1.80 at the end of the course.

The chapter officials believe that by assigning a substantial share of their budget to such educational activities, they are discharging a responsibility to the sustaining members who contribute so largely to the chapter's support, Mr. Hudson explained.

Another factor in the large enrollment was the care taken in advertising the course and soliciting attendance. The Educational Committee and Executive Committee members worked long hours to circulate local industries in the metals and related fields. A roster of manufacturers was provided by the Akron Chamber of Commerce, and each company received a letter addressed to an individual in the top management. Registration blanks were not included in the solicitation letter but were supplied in any desired quantity to those companies expressing an interest. In the present enrollment of 447, 35 different companies are represe..ted.

That interest in the course is being maintained is evidenced by attendance figures running between 350 and 400 for the individual lectures. Another incentive for maintaining interest, in addition to the refund at the end of the course, is the award of a certificate to those who complete the course with a good attendance record. This certificate is provided by the national office of A.S.M., and Akron is one of the first chapters to make use of it. A copy of the certificate is shown in the accompanying photograph.

The most vital factors in the success of any educational course, however, are bound to be the quality of the subject, the caliber of the lecturers and the suitability and usefulness of the textbook provided.

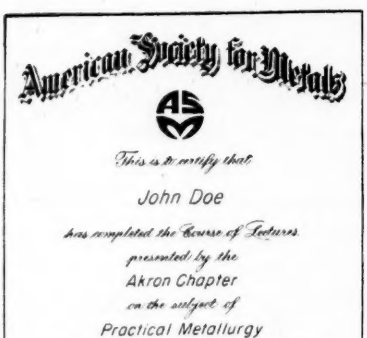
Akron's course on "Practical Metallurgy" encompasses six lectures on "Manufacture of Steel" (ideals in steelmaking; tests for composition); "Mechanical Testing" (surface inspection; hardness; tensile test); "Determination of Steel Quality" (soundness and macrography); "Looking Inside of Steel" (microscopy and grain size); "Special Treatments and Properties of Metals" (coatings, corrosion, impact, fatigue, creep, specifications); and "Welding of Metals". The seventh and final meeting of the course will consist of a general review and panel discussion.

Three instructors are responsible for presenting the six lectures. They are Columbus Floyd of Babcock & Wilcox Co., Arthur E. Marble of H & M Metal Processing Co., and N. C. Jessen of Babcock & Wilcox Co. These men are all members of the local chapter and all have had teaching experience. The lectures last about an hour and a half, with about a half hour devoted to questions and discussion.

The textbook is H. B. Pulsifer's well-known and popular "Inspection of Metals", which was written expressly as a teaching guide for the shopman and the layman. It is distributed free of charge by the chapter.

The Educational Committee was also fortunate in being able to secure a highly suitable meeting hall at University of Akron to accommodate the large attendance.

C. R. Augden of B. F. Goodrich Co. is chairman of the Akron Chapter, and Jack W. Hobbs of the Hobbs Co. is secretary.


American Society for Metals
This is to certify that
John Doe
has completed the Course of Lectures
presented by the
Akron Chapter
on the subject of
Practical Metallurgy
and has had an attendance record of 100%
Given this 22nd day of March 1950

S. A. E. 1065 Is Universal Spring Material — Hills

Reported by Ben Dixon

Assistant Sales Manager
Dominion Wheel & Foundries Limited

Speaking on "Springs and Spring Materials" before the Ontario Chapter A.S.M. on Feb. 3, O. R. Hills of the William D. Gibson Co. divided springs into three classes — mechanical springs, hot formed springs, and cushion and upholstery springs. The most satisfactory universal material, he said, is S.A.E. 1065 carbon steel, oil tempered or hard drawn. Music wire is also used.

Mr. Hills gave some important instructions for ordering and specifying springs. If a wire gage is shown on the requisitions, it should be followed by the decimal equivalent. Conditions of use should be considered when designing springs.

The surface of the wire must be perfect to guarantee against failure, and inspection and testing therefore play an important role in spring manufacture.

High Strength, Ductility Exhibited by Nodular Irons

Reported by Percy N. Bland

Canadian Sumner Iron Works, Ltd.

Nodular cast iron can be produced from a cupola or electric furnace, and—without heat treatment—carries the graphite in spherical form. The resulting mechanical properties are much superior to those of ordinary cast iron, said Mr. Rehder in his January address to a joint meeting of the British Columbia Chapters of A.S.M. and American Foundrymen's Society.

An inspiring speaker, J. E. Rehder is foundry engineer for the Bureau of Mines Research Foundry at Ottawa.

Until recently, the only method of producing constituent graphite in a nodular form was by a lengthy annealing process. However, we now have a melting routine whereby this very desirable graphite formation is produced on solidification.

Nodular cast iron, while not having the ductility of some steels, is much less brittle than ordinary irons. In the as-cast condition, said Mr. Rehder, tensile strengths up to 105,000 psi. can be had with some ductility.

Processing of the iron is handled by ladle additions of cerium or magnesium alloys. This is followed by ladle inoculations of ferrosilicon or other silicon alloys. Phosphorus of the ladle iron should preferably be less than 0.1%.

Speaks on High-Temperature Steels

Left to Right at Mahoning Valley Chapter's January Meeting Are: Wm. J. Baumgarten, Secretary-Treasurer; R. F. Miller of Carnegie-Illinois Steel Corp., the Speaker; and Harold Johnson, Chapter Vice-Chairman

Reported by J. G. Cutton
Carnegie-Illinois Steel Corp.

"Properties of Steel at Elevated Temperatures" was the subject of the Mahoning Valley Chapter's meeting of Jan. 10. Richard F. Miller, assistant to the vice-president in charge of research and technology for Carnegie-Illinois Steel Corp., was the speaker.

Dr. Miller described how various steels behave at elevated temperatures when subjected to creep and rupture tests. Such tests have been of great value in proper design of equipment and machines that operate at high temperatures. The speaker interpreted research data regarding such properties of steels as thermal expansion, thermal conductivity, modulus of elasticity, corrosion resistance, and scaling resistance.

Higher operating temperatures are anticipated for steam-generating power plants through the use of better alloy steels, Dr. Miller stated. Such steels should result in cheaper electricity and more efficient operation of the power plants. Incidentally, he observed, the cost of electricity in the past 25 years has been reduced some 50% by increasing operating temperatures from 650 to 1050° F.

Alloy steels which have higher strengths at red heat are in increased demand for use in gas turbines and in rocket motors for jet-propelled planes and guided missiles.

Syracuse Triple Bill Covers Quenching Media, Lubricants, Psychiatry

Reported by F. R. Morral
Assoc. Professor, Syracuse University

Syracuse Chapter A.S.M. featured a triple bill at its December meeting, covering quenching, lubricating oils, and psychiatry.

"Quenching Media" were discussed by J. McElgin of E. F. Houghton & Co., who presented the metallurgical background for the choice between water, oil and molten salts. Selection of the appropriate medium is related to the steel and its critical cooling rate, he said; size and shape of the part are also factors.

Essential characteristics of quenching oils are stability, high flash point, low viscosity, and rapid wetting out. The tendency now is toward compound quenching oils for the best combination of these characteristics. Mr. McElgin gave data and industrial examples of the performance of new high-temperature oils for interrupted quenching.

Turning to the use of molten salts for interrupted quenching, the speaker showed the effect of quenching speed, improvement by agitation, effect of the condition of the steel surface, and of size. These factors were related to applications in martempering and austempering.

The second speaker, H. C. Frisbie, also of E. F. Houghton & Co., talked on "Meeting Production Schedules with Modern Lubrication Engineering". After a brief introduction in which he noted the relationship between lubrication, the metallurgist and production, he contrasted the changes which have taken place in recent years. Today's modern, high-speed, high-production machine tools pose new requirements in lubricants.

The properties of lubricants are changed by "additives", which might be likened to the metallurgist's counterparts in heat treating and alloying processes. The speaker stressed the need of specification buying to obtain maximum performance, prolonged machine life and minimum inventory. In some plants, for instance, the number of lubricants has been reduced from 35 or 45 different items down to nine.

The coffee talk was presented by Dr. Raffaele of the Syracuse Psychiatric Society on the fascinating topic of "What Is a Normal Person?"

"Metal Show" to Be in Chicago

The 32nd Annual National Metal Congress and Exposition —the "Metal Show"—will open in Chicago's International Amphitheatre Oct. 23, 1950, and will run through the five weekdays, including Friday, Oct. 27.

The "curtain raiser", as usual, will be the American Society for Metals' annual Saturday and Sunday Seminar on Oct. 21 and 22. The 1950 Seminar will cover the subject of diffusion. Many of the country's top metallurgical experts will hold open sessions on Saturday morning, afternoon and evening, and sessions during the morning and afternoon on Sunday.

Floor plans have already been mailed, and the Exposition's space-assignment committee will meet on March 20 under W. H. Eisenman, managing director of the Metals Show, and executive secretary of the American Society for Metals.

Sponsoring the 1950 Metal Congress and Exposition in Chicago will be, in addition to the American Society for Metals, the American Welding Society, the Metals Branch of the American Institute of Mining and Metallurgical Engineers, and the Society for Non-Destructive Testing.

An anticipated attendance of between 35,000 and 40,000 metals engineers is expected, according to Eisenman.

At Kansas City

J. M. Goldsmith, Chairman of the Kansas City Chapter A.S.M., and H. B. Osborn, Jr. (Right), Technical Director of the Tocco Division of Ohio Crankshaft Co. Dr. Osborn was the principal speaker at the January meeting of the Chapter

Ground Is Barely Scratched for Hard Chromium Plate

Reported by **A. Floyd Whalen**
Consulting Metallurgist

Wherever there is a question of wear, rusting, corrosion, sticking, difficult cleaning or finishing, chromium plating will prove useful, according to R. E. Cleveland, vice-president of the Chromium Corp. of America. Mr. Cleveland addressed the January meeting of the York Chapter A.S.M. on "Industrial Chromium Plating".

Originally introduced as a decorative coating, chromium's natural properties soon caused it to be used for hard plating to withstand abrasion and erosion. The greatest volume of chromium plate is now going on standard machinery. Some parts weighing up to 80,000 lb. have been plated, requiring almost an equal number of amperes to throw the chromium over such a large body.

It is being applied to heavy hydraulic equipment, and has many uses in steel mills. Yet the ground has hardly been scratched, and daily new demands are being made upon it, many applications requiring months of trial and research to produce the desired results.

Chromium is now plated on cast iron, cast and forged steel, stainless steels, phosphor bronze and numerous other metals—even aluminum. The trade distinguishes between two grades of chromium plating—decorative plating and hard plating.

Chromium is one of the hardest metals — nine-tenths as hard as a diamond. It is resistant to more of the common corrosives than any of the other ordinary metals. Its one enemy is hydrochloric acid and other acids of the halogen group. With some chlorides care must be used to avoid temperatures that will cause decomposition and release acid.

Being extremely hard, chromium polishes brilliantly. It does not tear or pick up and the cuts from each emery particle are shallow and short. The reverse is true of copper and other soft metals which are troubled by long scratches and tail marks from piled up metal and loose grits between the job and wheel.

On the other hand, chromium, in the plating process, follows every imperfection or grain boundary in the parent body. If these are deep, chromium has to be undercoated to get a smooth surface. A preliminary copper plate is outstanding as a medium for filling up pits and grain boundaries in cast material. However, copper has a high rate of thermal expansion and is generally not used much above the boiling point of water. For higher temperatures a coat of nickel can be used in place of copper for a smooth undercoat.

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1951 *Transactions*. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 32nd National Metal Congress and Exposition to be held in Chicago, Oct. 23 to 27, 1950. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 15, 1950.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Basic Research Has Its Practical Aspects, Examples Demonstrate

Reported by **H. J. Fletcher**
E. F. Houghton & Co.

Samuel L. Hoyt, technical advisor of Battelle Memorial Institute, and author of many technical papers and several books on metallurgy, gave a talk on "Some Practical Aspects of Metallurgical Research" at the Dec. 19th dinner meeting of the Indianapolis Chapter A.S.M.

Dr. Hoyt explained the history of scientific research, which began in the middle ages in the fields of chemistry and physics. Gibbs' phase rule was one product of this research. Scientific work on metals really began in 1900 with the study of the constitution of alloys by Roozeboom and others, and the work of Ewen and Rosenhain on plastic deformation. The results of this early basic research are present everywhere in metallurgical practice today.

Coming to more recent work, the speaker told of his experiences in Germany for our Government. Steel cartridge cases that were superior to brass, iron rotating bands that were superior to copper, and a titanium machine gun steel were all the results of laboratory research. He also mentioned work at A. O. Smith Corp. on flash welded casing pipe, and at Battelle on the testing and inspection of natural gas pipelines.

These and other examples illustrated many practical aspects of research in metallurgy, and Dr. Hoyt explained that though the work is "highbrow", the results are seen to be practical when applied.

Looking to the future, he commented on work in England and Germany on the appraisal of superalloys for new high temperature applications. With a discussion of permissible creep under combined fatigue and multidirectional stresses, he concluded his instructive and interesting lecture.

Preceding the technical lecture a movie in technicolor on "The Manufacture of Malleable Iron" was shown.

Compliments

To FRANCIS C. FRARY, director of research, Aluminum Co. of America, on the award of the James Douglas Metallurgical Medal for 1950 by the American Institute of Mining and Metallurgical Engineers.

To LINCOLN T. WORK, consulting engineer, Newark, N. J. (formerly director of research and development for Metal & Thermit Corp.), on his election as chairman of the division of industrial and engineering chemistry of the American Chemical Society.

To HERBERT R. ISENBURGER, president, and ANCEL ST. JOHN, vice-president and director of St. John X-Ray Laboratory, on the celebration of the firm's 25th anniversary.

To JOSEPH L. AUER, president of R. Hoe and Co., on his appointment as chairman, for the second consecutive year, of the Bronx Appeal of the Greater New York Fund, a charitable drive.

To HANS ERNST, director of research, Cincinnati Milling Machine Co., on being named "Cincinnati's outstanding engineer of 1949-50" by the Technical and Scientific Societies Council of Cincinnati.

To S. B. HEPPENSTALL, SR., chairman of the board of directors of Heppenstall Co., Pittsburgh, on his retirement after completing 51 years with the company.

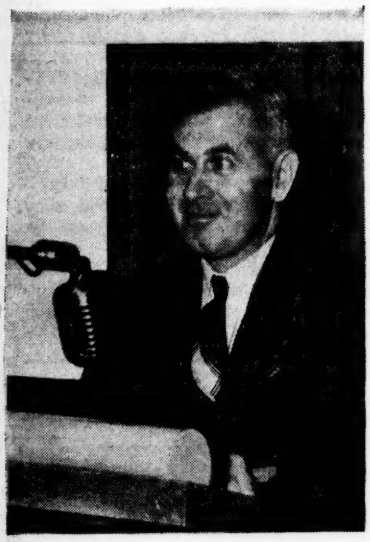
To HENRY B. ALLEN, executive vice-president and secretary of the Franklin Institute, on the honorary degree of Doctor of Engineering, granted by Drexel Institute of Technology, Philadelphia.

Steps Taken to Minimize Corrosion in Automobiles

Reported by Malcolm G. Simons
Pressed Metals of America, Inc.

"Corrosion Aspects of Automotive Engineering" was the subject of the Jan. 9th meeting of the Detroit Chapter A.S.M., presented by F. L. LaQue, director of the corrosion engineering section of the International Nickel Co.'s development and research division. Mr. LaQue explained the critical spots in automobiles where corrosion takes place, and told what steps can be, and are being, taken to cut corrosion to a minimum.

The coffee talk featured the supervisor of District 12 for the Michigan Department of Conservation, George Taack, who outlined conservation activities in the State of Michigan.



F. L. LaQue at Detroit

Mehl Heads Military Group

Robert F. Mehl of Carnegie Institute of Technology has been appointed chairman of the committee on metallurgy of the Research and Development Board, National Military Establishment. Dr. Mehl is director of Carnegie's Metals Research Laboratory and head of the school's metallurgical engineering department.

In his new appointment, Dr. Mehl is investigating the highly complex problem of coordinating all the metallurgical research and development undertaken by the many technical agencies of the military departments. He will also advise on immediate problems.

Dr. Mehl has also been recently appointed as a member-at-large of the National Research Council of the National Academy of Sciences.

Huge Reserves of Titanium Ore Available to U. S.

Reported by Robert L. Needham
Metallurgical Engineer
Delco Products Div.

Although supplies of titanium metal are limited and wrought products are expensive, huge reserves of ore are available on the North American continent. Furthermore, the United States is at present the chief producer of titanium, according to Howard Cross, a supervising metallurgist at Battelle Memorial Institute, speaking in Dayton, Ohio, on Jan. 11. Mr. Cross addressed a joint meeting of A.S.M. and the American Society of Mechanical Engineers.

Several processes have been perfected for winning the metal from its ores. The purest product is made by the so-called "iodide" method, in which crude, nonductile titanium is converted to titanium iodide; this is then decomposed and titanium metal deposited upon contact with a hot titanium filament. Commercially, titanium is being produced by reduction of the tetrachloride by magnesium metal, which gives a "sponge" of titanium metal.

Physical properties of pure titanium are 38,000 to 48,000 psi. ultimate, 22,000 psi. yield, with an elongation of about 40% and reduction of area about 75%. Alloys have been investigated which show 190,000 psi. ultimate with about 2.5% elongation.

The most promising elements for alloying with titanium appear to be chromium, vanadium, carbon, nitrogen, manganese, aluminum, and molybdenum. Specific gravity of the metal is about 4.5 compared to 7.8 for steel and 2.5 for aluminum. However, Young's modulus for titanium is only about 16,000,000 psi.

For elevated-temperature duty the titanium alloys are about 400° F. better than aluminum alloys. Rotating beam fatigue tests on bar stock have shown endurance limits of about 50% of the ultimate tensile strength. Thermal conductivity is poor when compared to aluminum and magnesium. Damping capacity is low.

For salt water corrosion resistance titanium is better than 18-8. Its machinability is not good—similar to 18-8. It can be welded—at least to itself. Friction properties are poor—wiredrawing is impossible without a lubricant such as oxide scale, plated copper, or similar expedient.

A highly interested audience fired question after question at Mr. Cross after his lecture, and nearly all of these questions were answered directly.

THIRTY YEARS AGO

After a short life as independent organizations, the Steel Treating Research Society and the American Steel Treaters Society merged in 1920 to form the present American Society for Metals. The early issues of the publications of these two societies (the Proceedings *and the* Journal*) are filled with nostalgic and historical associations. — Ed.*

—30—

The first convention and exposition of the society, held in Chicago in 1919, was welcomed by President TED E. BARKER, production manager for Miehle Printing Press and Mfg. Co. The president's glowing predictions for the future of the society showed remarkable foresight; they included "ownership of our own well-appointed building . . . compilation of records and standards . . . in 'handbook' form . . . a literature cataloging and indexing service . . . simultaneous technical sessions at annual conventions . . . and a union of all interests and forces in our line of endeavor".

—30—

Eminent speakers at the annual banquet of the American Steel Treaters Society included HENRY MARION HOWE, honorary member and professor emeritus of Columbia University (later to be honored by the dedication of the A.S.M. Howe Medal).

—30—

A list of trade names and manufacturers of toolsteels constitutes a contribution to a 1919 issue of the *Proceedings*. Still familiar on this list are the names of old standbys such as MIDVALE, CRUCIBLE, JESSOP, COLONIAL, HALCOMB, VANADIUM, CARPENTER, LUDLUM, COLUMBIA, and FIRTH-STERLING.

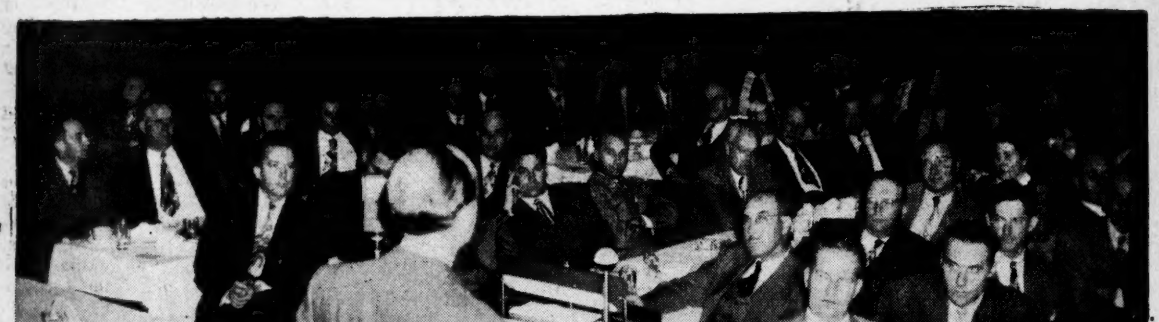
—30—

J. E. STEAD, F.R.S., of England—a name reserved for metallurgical posterity as "steadite", "Stead's reagent", and "Stead's brittleness"—became a member of the Steel Treating Research Society in 1919.

—30—

A speaker at the annual meeting of the Steel Treating Research Society in 1919 was the late JOHN A. MATHEWS of Halcomb Steel Co. (later director of research and for a time president of Crucible Steel Co., and an honorary member of A.S.M.). Dr. Mathews' 1919 paper on "Present and Future Status of Alloy Steels" is now preserved in the Sauveur Memorial Museum at A.S.M. headquarters.

Describes Corrosion Protective Measures in Modern Industry



Part of the Los Angeles Chapter Group Addressed by Richard Pomeroy on Corrosion in Industry

Reported by Jack Dickason
Metal Control Laboratories

"Corrosion and corrosion protective measures affect American industry at a cost of three and one-half billion dollars yearly" was the introductory remark of Richard Pomeroy, of Pomeroy and Wescot, in an address before the Los Angeles Chapter A.S.M. on Jan. 12. The advancement of protective measures to combat corrosion problems and a better understanding of the causes of corrosion in modern industry constituted the main topics of Dr. Pomeroy's discussion.

Electrolytic reaction and its sometimes baffling effects were explained with considerable detail by the speaker, while stressing the importance of corrosion research and its application to pipeline and tank construction in Southern California.

Choice of alloy as well as the choice of proper protective coatings should have the most careful consideration of today's designing engineer. Dr. Pomeroy gave comparative corrosion resistance data on coatings (metallic and nonmetallic), plating, paint applications, and the cathodic protection process. Slides showing the effect of acidity and alkalinity on different alloys, as well as corrosion phenomena encountered in various investigations made Dr. Pomeroy's talk interesting as well as informative.

Shows How TTT-Curves Speed Steel Production

Reported by G. F. Kappelt
Metallurgist, Bell Aircraft Corp.

Through an understanding of the decomposition of austenite, many difficulties in production and use of steel can be explained. Case histories substantiating this statement were presented to the Buffalo Chapter A.S.M. by John V. Russell, director of metallurgical laboratories, Republic Steel Corp., South Chicago Works.

After first defining his terms, Mr. Russell gave a thumbnail sketch of the method by which austenite decomposes. After giving due credit to the laborers who produce TTT-curves, he pointed out how these curves can vary from heat to heat and therefore can be put to only limited use.

Because of this fact and the fact that Republic wishes to use isothermal transformations in their process work, they have developed a quick method for producing a rough TTT-curve. It consists of the transformation in a specially designed furnace which has a 600 to 1500° F. temperature gradient. Therefore, one sample cooled in this furnace equals many customary samples.

Utilizing a knowledge of the TTT-curves, Republic has been successful in lowering the time cycles on their process work while maintaining satisfactory quality.

Slides were presented showing typical microstructures for various alloy steels to get best machinability. Advantages and disadvantages of isothermal annealing cycles also were discussed in this regard. The nature and effect of the martensite transformation were described.

Hoosier Schoolmaster in Philadelphia

Left to Right at Philadelphia Chapter President's Night Are National Secretary W. H. Eisenman, President Arthur E. Focke, Claude Roth, J. G. Jackson, Fred Cooper, Chapter Secretary; and E. K. Spring, Chairman

Reported by C. W. McKee
Test Engineer, Midvale Co.

The Philadelphia Chapter A.S.M. has awarded a shiny red apple to its Hoosier schoolmaster and national president, Arthur E. Focke. President Focke presented his interesting lecture on "Wear" before a crowded classroom and the pupils were well rewarded for the sore throats and strained vocal cords that resulted from the mass recitations.

A spirited discussion followed the talk and an overwhelming majority of those present voted in favor of the president's novel presentation. Secretary Eisenman gave a heart-warming talk in which he showed that the metallurgist of today is receiving financial as well as verbal appreciation for his efforts.

Copper-Base Alloy For Drawing Dies Holds Promise

Reported by Harold M. Brodsky
Metallurgical Department
Fafnir Bearing Co.

Past, present and future uses of copper-base alloys formed the subject ably presented by Stuart C. Lawson, general sales manager of Ampco Metal, Inc., in a talk before the Hartford Chapter, A.S.M. at the first meeting of the New Year.

Mr. Lawson introduced this subject by showing a sound film in technicolor entitled "Golden Horizons" which traces the history of copper, iron and aluminum from ancient times up to the present day. There are seven different classes of copper-base alloys, the speaker explained, and outlined the properties and uses of each.

Continuous Casting Cited

Continuous casting of phosphor bronze is considered one of the major developments in industrial nonferrous metallurgy of the past decade, according to Mr. Lawson. However, the method is not practical for production of all copper-base alloys at present.

Mr. Lawson spoke at length on the use of a centrifugally cast copper-base alloy containing aluminum and iron for the surface of deep drawing dies. This material was compared to tungsten carbide dies both from a quality and economy standpoint, and can be rated better than the former for many drawing applications, especially where a high-luster finish must be preserved in the drawing operation.

The hardness and structure of this alloy are such that the die contours are retained after considerable use, and the materials being drawn are not scored or marked in any way. Continuing metallurgical investigation into the reasons for these qualities is expected to lead to even better nonferrous alloys for drawing die use.

Need for Standardization

Mr. Lawson commented on the great need for standardization of nonferrous alloys, similar to the standards prescribed for iron alloys by the S.A.E. and A.I.S.I. He also stressed that the future of the copper alloy industries is dependent on metallurgical research and development; more emphasis should be placed on nonferrous alloys in metallurgical education.

Thomas P. Hanford, assistant metallurgist of the Stanley Works, New Britain, Conn., introduced the speaker and acted as technical chairman in the lengthy question period following the talk.

Rhode Island Has Series Of Lectures on Jewelry

A five-week lecture series on "Metals Used by the Jewelry Industry" was co-sponsored during February and early March by the Rhode Island Chapter A.S.M. and the New England Manufacturing Jewelers' and Silversmiths' Association. The program constituted an effort to provide interesting factual information on the metals and processes of particular importance to the jewelry industry, which represents a high percentage of local manufacturing capacity.

The series was opened on Feb. 7 with an "Introduction to Metals Used in Jewelry" presented by Howard F. Taylor, associate professor of metallurgy, Massachusetts Institute of Technology. The four succeeding lectures covered the individual metals copper, nickel, silver, and gold, and their alloys. They were presented in nontechnical language by leading authorities and specialists in their respective fields.

Free tickets to the lecture series were distributed by both the Rhode Island Chapter A.S.M. and the Jewelers' Association. Kenneth H. Mairs of Rhode Island State College is chairman of the Rhode Island Chapter Educational Committee, which helped plan the program.

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RYERSON STEEL

Krause Explains Nodulation Process For Cast Iron

Reported by W. Manuel
Metallurgist, AC Spark Plug Div.

Special emphasis was placed upon nodular iron in a talk on "Properties of Ferrous Cast Metals" at the third meeting of the Saginaw Valley Chapter A.S.M. held on Jan. 17. Dan E. Krause, executive director of Gray Iron Research Institute, illustrated his talk with slides.

Mr. Krause showed how a Class 20 gray iron, which has a tensile strength of 25,000 psi., can be produced with a tensile strength of 75,000 psi. by the addition of magnesium or cerium to the ladle prior to casting. Addition of the proper amount of either of these elements will reduce the sulphur content to 0.01 to 0.02%, and the remainder will cause the graphite to be dispersed in the form of spheroidal particles. Such a structure has increased tensile strength and ductility.

For complete spheroidization, the magnesium or cerium content should be maintained at a minimum of 0.05 to 0.06% in the finished cast iron. Magnesium is used almost exclusively for nodulation of cast iron in the United States while cerium is used primarily in England. Cerium can only be used in hypereutectic irons and is very expensive. It has one advantage in that it does not volatilize.

Nodular iron can be produced with excellent ductility although the reasons for unusually high values are not fully understood. Tensile strength may vary from 75,000 to 175,000 psi., elongation from 5 to 20%, and hardness from Brinell 120 to 600. This wide range of physical properties can be controlled by chemistry, cooling rate and heat treatment. The damping capacity is less than that of ordinary gray cast iron. The tensile strength of nodular iron decreases with section size but to a lesser degree than for gray iron.

Nodulation of irons containing over 0.30% phosphorus is not effective in improving physical properties even though the graphite is completely spheroidized. Phosphorus should be maintained at 0.10% or less if maximum physical properties are desired.

Machinability is about equal for gray and nodular iron although the latter will exhibit a better surface finish. Close examination of a nodular iron casting will reveal a slightly pitted surface which is caused by the spheroidal particles being rolled or pulled out during the machining operation.

Nodular iron has been used for parts in high compression engines and for heat resistant applications. It is also used for various machinery parts and other applications where improved shock resistance is a desirable factor.

Steels for High Temperatures Grouped

C. L. Clark (at Right), Metallurgical Engineer, Timken Roller Bearing Co., Was the Principal Speaker at the January Meeting of the Texas Chapter. At left is Harold Schmid, General Metals Corp., chapter vice-chairman

Reported by Leland V. Dolan
Dolan Industrial Sales

A general review of present knowledge of high-temperature steels was presented at the Jan. 3rd meeting of the Texas Chapter A.S.M., meeting in Houston. C. L. Clark, metallurgical engineer for special steel developments, Timken Roller Bearing Co., was the speaker.

The temperature range of industrial importance extends from 300 to 2400° F., Dr. Clark pointed out. Temperatures up to 1800° F. are important insofar as service applications are concerned, while properties above this temperature are important in hot forming applications, such as rolling, forging, and piercing into seamless tubes.

The high-temperature steels now in use fall into three groups—low alloy, intermediate alloy, and stainless. The characteristics of each of these groups were reviewed and the reasons given for the various alloy additions.

In the selection of steels for a given application, six factors must be considered: *(a)* expected life of the equipment, *(b)* temperature and pressure involved, *(c)* degree of corrosion and oxidation, *(d)* permissible deformation, *(e)* hazards involved if failure should occur, and *(f)* cost and availability of the steel.

Dr. Clark then outlined the tubular requirements of steam generating plants operating at 1000 and 1050° F., as an example of how the most economical steel can be selected to meet each of the varying requirements.

In conclusion, he told how the hot twist test can be used for determining the proper temperature for various hot forming operations. In general, as the alloy content is increased, the permissible maximum temperature of hot forming is decreased.

Corrosion Theory Clearly Explained

Reported by R. D. Wylie
Metallurgist, Babcock & Wilcox Co.

The electrochemical theory of corrosion was clearly explained in a talk on "Corrosion of Metals", presented by C. F. Prutton, vice-president and director of operations of the Mathieson Chemical Corp., at the regular monthly meeting of the Akron Chapter A.S.M. on Jan. 11. Slides and charts were used to illustrate the types of reactions which may occur in a corrosion cell.

Dr. Prutton explained the meaning of many of the terms which are used in corrosion literature, such as solution potential, hydrogen overvoltage and electromotive series; diagrams of simple anode and cathode cells illustrated these terms.

Certain specific types of electrochemical cells are important in industry. First is the cell set up by contact of two dissimilar metals in an electrolytic solution, such as iron and copper. Other types of cells—such as the oxygen concentration cell and the metal-ion concentration cell—are substantially similar, in that there is a small anodic area in contact with a large cathodic area with resultant solution of metal at the anode.

Dr. Prutton illustrated several methods for inhibiting the process of corrosion, and explained his theory for the action of some of the commercial inhibitors. Galvanic protection equipment can be provided by a magnesium anode which will tend to dissolve preferentially when in contact with iron in corrosive media. Pipe lines, hot water, and storage tanks are a few of the commerical applications of such protection devices.

Preceding the technical talk Jack Smith, president of RCA Rubber Co., presented an interesting description of his recent trip to Wales.

Four Processes for Continuous Casting In Commercial Use

Reported by D. B. Graves
Federated Metals Division
American Smelting and Refining Co.

Continuous casting as a method for producing shapes from molten metal was first suggested by Henry Bessemer, J. S. Smart, Jr., superintendent of copper developments, American Smelting and Refining Co., told the Calumet Chapter A.S.M. on Jan 10. Mr. Smart presented the subject of continuous casting of copper and copper alloys in an interesting manner, well illustrated by diagrams and photographs of the process.

The early experiments were not successful, and it wasn't until about 15 years ago that progress by various organizations resulted in bringing the process to a commercial status. At least four types of processes are now in use, commercially, and others are being developed by several companies here and abroad.

In the Asarco process, the brass or bronze alloy to be cast is melted in a Detroit arc furnace and fed to a reservoir from which the metal is introduced into the die, where adequate cooling facilities promote solidification. The solidified metal is withdrawn continuously by a set of rolls and the die is replenished by gravity feed. The product is cut to the required length by a power saw and prepared for shipment.

The Asarco continuous casting process is unique by virtue of its versatility in producing rod and tube to a large variety of shapes and sizes with exceptionally good physical properties. The shape of the product depends almost entirely on the ability to machine the form in the graphite die. The Asarco process is the only commercial continuous casting process at the present time that produces finished copper alloy stock for machining operations.

Among interesting construction details of the process are the extensive use of graphite for various parts of the lining in the casting furnace, and the die which controls the shape of the product. Die design and die manufacture are very important.

The physical properties of the continuous cast product, reported Mr. Smart, are usually superior to those cast by sand or permanent mold methods. Yield strength and fatigue limit are outstanding in this respect. The product is free from porosity and approaches the theoretical value for density. Photomicrographs revealed the extreme fineness of the continuous cast product as compared with permanent mold and sand-cast alloys. Because of the high quality achieved, brass and bronze alloys can be designed to carry greater loads. Also, because of the close size tolerances that can be maintained, there is less waste in the manufacture of bearings, bushings, and other products.

Rare Earths Offer Promise as Alloys With Magnesium

Reported by Melvin R. Meyerson
Metallurgist
National Bureau of Standards

Improved mechanical properties at elevated temperatures seem to be in store for magnesium alloyed with the rare earths, the Washington Chapter A.S.M. learned at its Jan. 9th meeting, when John C. McDonald, assistant technical director, Magnesium Division, Dow Chemical Co., spoke on "Recent Developments in Magnesium".

Tests on alloys of magnesium with the rare earths have included binary and tertiary alloys with about 3% of didymium (a combination of neodymium and praseodymium), mischmetal (cerium alloy), cerium, lanthanum, cerium-free mischmetal, praseodymium plus lanthanum, and others. Of these combinations the magnesium-didymium alloy had the highest tensile strength and greatest resistance to creep at 400° F., and lanthanum was the poorest alloy. As a group all of these materials have considerably better properties than the usual alloying metals.

Another promising alloy contains magnesium and lithium with either zinc or aluminum. Quenched at —100° F., it has a tensile strength as high as 70,000 psi., but, unfortunately, is very brittle. Much more work needs to be done on this alloy before its amazing tensile strength can find practical utilization.

Fatigue properties of the regular alloys are improved by cold working the surface, Dr. McDonald pointed out. A rubbing process has been found most effective for this purpose.

A new method for obtaining extremely fine-grained magnesium alloy utilizes atomized magnesium alloy powder put through an extrusion process. New applications for magnesium include its use in the production of ductile iron, in the manufacture of primary battery cases, and as photo-engraving printing plates.

Dr. McDonald believes that magnesium applications and the magnesium industry will expand considerably in the future. He cited the high order of potential availability of the metal; since it is obtainable from sea water, it is available in quantity to nearly all the countries in the world. Production capacity increased during the recent war from 6 million pounds per year to about 600 million.

U. S. May Become "Have-Not" Nation In Some Minerals

Reported by Richard P. Seelig
American Electro Metal Corp.

The commonly held idea that the United States is a "have" nation may be subject to considerable revision, predicted Joseph Zimmerman, editor of *Daily Metal Reporter*. Dr. Zimmerman addressed the New York Chapter A.S.M. on Jan. 9 on "The Metal Situation".

During the war years several critical commodities had to be imported from abroad. Among these were asbestos, carborundum ore, graphite, nickel, tin and many others. A majority of our supplies of chromium, cobalt, manganese and tungsten also had to be brought in during these critical years.

Even items now available from domestic deposits may become scarce in the future, the speaker said; deposits which are considered commercial are beginning to run low. Figures quoted from government sources indicate that mercury deposits will be depleted in about three years; platinum, tungsten and antimony in four years; vanadium in seven; lead in 12; cadmium in 16; and zinc in 19 years. The domestic commercial deposits of copper are estimated to be good for another 34 years, and all the important iron for 111 years.

However, improvements in metallurgical processes and changes in the price structure may render poor deposits commercial in the future. It is also to be anticipated that some new resources will be discovered.

In peacetime many of these materials can readily be imported, but in times of crisis this may not be possible. This throws the spotlight on the government stockpiling program, which is intended to cover just such emergencies. Nevertheless, it is also well for American metal men to be aware of the fact that we may become a "have-not" nation on certain metals important to the country's economy.

Prizes for Papers on Welding

Announcement has been made of cash prizes to be awarded in 1950 by the Resistance Welder Manufacturers' Association for outstanding papers dealing with resistance welding subjects. The total amount of the awards is $2250.

Entries are to be sent to the American Welding Society, 33 West 39th St., New York 18, N. Y. The contest closes July 31, 1950. The rules governing the contest may be secured either from the American Welding Society or from the Resistance Welder Manufacturers' Association, 505 Arch St., Philadelphia 6, Pa.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Apr. 12	University Club	P. H. Setzler	Stress Raisers in Welded Joints
Baltimore	Apr. 17	Engineers Club	Sam Epstein	Deep Drawing Steel
Birmingham	Apr. 4	Hoopers Cafe	S. L. Hoyt	Metallurgy of Welding
Boston	Apr. 14	Hotel Sheraton	G. B. Waterhouse	Sauveur Night
Buffalo	Apr. 13	Red Coach Inn, Niagara Falls	W. A. Wissler	Some Unusual Applications of Cobalt-Chromium Alloys
Calumet	Apr. 11	Phil Smidt & Son, Whiting, Ind.	H. S. Van Vleet	Engineering the Tin Can
Canton-Massillon	Apr.	Mergus Restaurant	J. D. Armour	Machinability
Chattanooga	Apr. 4			Joint Meeting With Birmingham Chapter
Chicago	Apr. 10	Furniture Mart Building	Shadburn Marshall	Turbohearth Process
Cincinnati	Apr. 11	Columbus, Ohio		Metal Castings (Tri-Chapter Meeting)
Cleveland	Apr. 3	Tudor Arms Hotel	L. P. Tarasov	Some Metallurgical Aspects of Grinding
Columbus	Apr. 11	Fort Hayes Hotel		Metal Castings (Tri-Chapter Meeting)
Dayton	Apr. 11	Columbus, Ohio		Metal Castings (Tri-Chapter Meeting)
Des Moines	Apr. 11	Younkers		Joint Meeting With A.S.M.E.
Detroit	Apr. 10	Rackham Bldg.	R. S. Stewart	Metallurgy, Properties and Application of Titanium
Fort Wayne	Apr. 10	Chamber of Commerce		Mechanical and Physical Properties of Nodular Cast Iron
Hartford	Apr. 11			Plant Visitation
Indianapolis	Apr. 17	McClarney's Restaurant	George M. Enos J. W. Burr	Limitations of Metallurgical Tests Statistical Quality Control
Los Alamos	Apr. 24	Civic Club, Little Theatre	W. E. Mahin	Metal Research
Los Angeles	Apr. 27	Rodger Young Audit.	Donald S. Clark	The Principles of Testing and Inspecting Products
Louisville	Apr. 4		C. H. Stevenson	Heat Treating Furnaces and Equipment
Mahoning Valley	Apr. 11	V.F.W. Hall, Youngstown	F. H. Allison, Jr.	Roll Manufacture and Applications
Milwaukee	Apr. 18	City Club	P. Payson	Fundamentals of Heat Treatment
Montreal	Apr. 3	Queens Hotel	R. J. Edmunds	Metals as Money
Muncie	Apr. 11	Muncie Central High School	Robert Cryter	Atomic Power in War and Peace
New Haven	Apr. 20	New Haven Lawn Club	R. A. Wilkins	Management and the Metallurgist
New Jersey	Apr. 17	Essex House, Newark	J. B. Rutherford	Steel for High-Temperature Service
New York	Apr. 10	Building Trades Club	G. E. Claussen	New Developments in Welding Metallurgy
North Texas	Apr. 19	Fort Worth	F. T. McGuire	X-Ray Diffraction
Northwest Pa.	Apr. 20		J. R. Green	Principles of Temperature Measurement and Control
Notre Dame	Apr. 12	Engineering Audit., Univ. of Notre Dame	Fred Keller	Conditioning of Aluminum Alloys for Electroplating
Ontario	Apr. 5	Royal Connaught Hotel, Hamilton	Morris Cohen	Transformations in Steel
Ottawa Valley	Apr. 4	Bureau of Mines	R. J. Edmunds	Metals as Money
Peoria	Apr. 3		M. Kuniansky	Nodular Cast Iron
Philadelphia	Apr. 28	Engineers Club	F. G. Tatnall	Testing—Up-to-Date and Simplified
Pittsburgh	Apr. 13	Roosevelt Hotel	J. H. Hollomon	Plastic Deformation of Metals
Puget Sound	Apr. 19	Engineers Club	James Gow	Heat, Corrosion and Abrasion Resistant Alloys—Production, Metallurgy and Application
Purdue	Apr. 22	Purdue Union Memorial		Statewide Symposium—Joint Meeting (All Day)
Rhode Island	Apr. 5		J. R. Hunter	Welding Nonferrous Alloys
Rockford	Apr. 26	American Steel & Wire Co., Waukegan, Ill.		Plant Visitation
Rocky Mountain	Apr. 20 Apr. 21	Pueblo Denver	W. E. Mahin	Metal Research
Saginaw Valley	Apr. 18	Frankenmuth, Mich.	H. A. Weissbrodt R. D. Long	Quality Control in Action
Southern Tier	Apr. 18			Annual Engineering Council Meeting
Springfield	Apr. 17	Hotel Weldon, Greenfield	G. A. Roberts	High Speed Steels
St. Louis	Apr. 13	Stratford Hotel, Alton, Ill.	Bruce Gonser	Unusual Metals
Syracuse	Apr.			Plant Visitations
Terre Haute	Apr. 3	Indiana State Teachers College Student Union	J. J. Kanter	Materials for Valves, Fittings, and Piping
Texas	Apr. 4			
Toledo	Apr. 27		Carl Heussner Lee Morse	Plating
Tri-City	Apr. 11	Rock Island Arsenal Cafeteria	T. Embury Jones	Resistance Welding for Design Engineers

Utah	Apr. 27	Salt Lake City	F. J. Robbins	National Officers' Night
Warren	Apr. 13			Plant Visitation
Washington	Apr. 10	Dodge Hotel	Shadburn Marshall	The Turbohearth Process
West Mich.	Apr. 17			Plant Tour
Western Ont.	Apr. 21	Windsor	Dr. Wiley	Specifications of Steel
Wichita	Apr. 18	K. of C. Hall	Dana Smith	75 S Aluminum
Worcester	Apr. 12	Mass. Steel Treating Corp.	Howard Boyer	
York	Apr. 19	Gettysburg, Pa.	J. G. Morrison	High Speed Steels and Their Treatment

Tatnall Speaks at St. Louis

Francis G. Tatnall (Center), Manager of Testing Research of the Baldwin Locomotive Works, Talked on the "Relationship Between Engineering Metallurgy and Material Specifications" Before the St. Louis Chapter on Jan. 20. At left is Lewis Malpocker, chapter chairman, and at the right Carl W. Messinger, program chairman. (Reported by N. O. Nordquist)

Quarter Century Club

The following A.S.M. members have been awarded honorary certificates commemorating 25 years' consecutive membership in the society:

Boston Chapter—Harrison I. Dixon, Earl N. Downing, Howard W. Fairchild, Frederick P. Flagg, Louis Kalender, Lindley I. Dean. Sustaining membership: United Shoe Machinery Corp. (John D. Paine, representative).

Milwaukee Chapter—C. K. Charlton, Gilbert F. Kurtz, William H. Naegely, Roland A. Ragatz, Edward L. Roth. Sustaining memberships: Columbia Tool Steel Co., Hevi Duty Electric Co.

New Haven Chapter—John R. Freeman, John F. Sargent, Henry B. Smith, Fred E. Stockwell. Sustaining membership: Heppenstall Co. (Raymond T. Porter, representative).

Pittsburgh Chapter—H. Walter

(Continued in column 3)

Berkley, F. W. Bremmer, J. Russell Case, Nelson E. Cook, William L. Fink, Ray Fitterer, Erle G. Hill, Fred Keller, V. H. Lawrence, W. J. Long, H. D. Newell, W. H. Norris, N. B. Ornitz, H. E. Passmore, H. H. Passolt, Charles Purnell, Harry C. Riddile, F. H. Rys, Norman I. Stotz.

Los Angeles Officer Moves

O. E. Andrus, vice-chairman, Los Angeles Chapter A.S.M., has moved to Milwaukee to assume new duties as manager of the A. O. Smith Research Laboratories. He will continue, however, to handle his responsibilities as vice-chairman of the Los Angeles Chapter until his term is completed in May.

IMPORTANT MEETINGS FOR APRIL

April 3-4—Association of Iron and Steel Engineers. Spring Conference, Birmingham, Ala. (T. J. Ess, managing director, A.I.S.E., Empire Bldg., Pittsburgh 22, Pa.)

April 4-7—National Association of Corrosion Engineers. Sixth Annual Conference, Jefferson Hotel, St. Louis, Mo. (A. B. Campbell, executive secretary, N.A.C.E., 919 Milam Bldg., Houston 2, Texas.)

April 5-7—Midwest Power Conference. Sponsored by Illinois Institute of Technology, Sherman Hotel, Chicago. (R. A. Budenholzer, director of conference, professor of mechanical engineering, Illinois Institute of Technology, 3300 South Federal St., Chicago 16, Ill.)

April 5-7—American Institute of Electrical Engineers. Conference on Electric Welding, Detroit. (A.I.E.E., 33 West 39th St., New York 18, N. Y.)

April 10-12—American Institute of Mining and Metallurgical Engineers. 33rd Annual Conference of the Openhearth Steel Committee and Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, A.I.M.E., Netherland Plaza Hotel, Cincinnati, Ohio. (Ernest Kirkendall, secretary, Metals Branch, A.I.M.E., 29 West 39th St., New York 18, N. Y.)

April 10-12—American Society of Lubrication Engineers. Fifth Annual Convention, Hotel Statler, Detroit. (W. F. Leonard, secretary-treasurer, A.S.L.E., 343 South Dearborn St., Chicago 4, Ill.)

April 10-14—American Society of Tool Engineers. Annual Meeting and Industrial Cost-Cutting Exposition, Convention Hall and Commercial Museum, Philadelphia. (H. E. Conrad, executive secretary, A.S.T.E., 10700 Puritan Ave., Detroit 21, Mich.)

April 11-12—American Zinc Institute. 32nd Annual Meeting, Hotel Statler, St. Louis, Mo. (Ernest V. Gent, secretary, A.Z.I., 60 East 42nd St., New York 17, N. Y.)

April 12-14—American Society of Mechanical Engineers. Spring Meeting, Washington, D. C. (C. E. Davies, secretary, A.S.M.E., 29 West 39th St., New York 18, N. Y.)

April 14-15—Ohio State Welding Engineering Conference. Sponsored by Ohio State University, O.S.U. Campus, Columbus, Ohio. (Department of Welding Engineering, Ohio State University, Columbus 10, Ohio.)

April 24-27—American Management Association. 19th National Packaging Exposition, Navy Pier, Chicago. (Edward K. Moss, public relations director, A.M.A., 330 West 42nd St., New York 18, N. Y.)

April 25-26—Metal Powder Association. Sixth Annual Meeting and Metal Powder Show, Book-Cadillac Hotel, Detroit. (M.P.A., 420 Lexington Ave., New York 17, N. Y.)

Educational Course Is on Salt Baths

Reported by Fred Gieseking
Detroit Testing Laboratory, Inc.
and
R. B. Boswell
Research Metallurgist, Chrysler Corp.

Two lectures on "Salt Baths in Metal Processing" constituted the fall educational course of the Detroit Chapter A.S.M. D. J. Henry, senior project engineer for the research laboratories division, General Motors Corp., presented the first lecture, and H. L. Alexander, manager of the metal descaling division, E. I. du Pont de Nemours & Co., Inc., presented the second.

"Hot Salt Quenching" was Mr. Henry's subject, illustrated by drawings and photographs of equipment and circulation systems. Uniformity of salt flow over the quenched part, as well as rate of flow, is essential, he pointed out. Mechanical agitators in the quench bath do not give satisfactory results.

More than 4000 parts have been heat treated by this method, with uniform hardness, dimensional stability and no cracking. Mr. Henry cited many case histories of such parts. In general, carburized parts tend to shrink when quenched in hot salts, whereas parts made from through-hardening steels tend to grow. Parts of various cross-sectional size, however, can be successfully treated.

Topic of Mr. Alexander's lecture was "Sodium Hydride—Caustic Soda Metal Cleaning". He explained the reactions occurring between sodium hydride and oxides of iron, and described the basic equipment used in the process. Parts so treated will have a bright, smooth surface if the underlying surface before cleaning is devoid of pits or other deep surface imperfections.

Among commercial products cleaned by this method are wire, bar, sheet, strip, forgings, stampings, and heat treated parts of carbon and other steels. The Lukens Steel Co., Coatesville, Pa., devotes an entire building to cleaning large rolled plates by the sodium hydride method.

The process is used advantageously for cleaning ferrous metals prior to hot dip coating and plating, and for removing residual amounts of sand from castings cleaned by mechanical methods. The cleaning of titanium metal and stainless steel powder are among the more unusual applications for this process.

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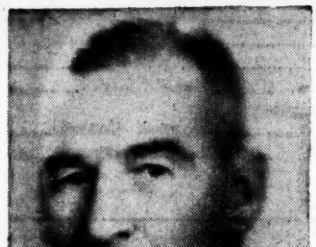

William B. Price, Who Retired Recently as Director of Research for Scovill Mfg. Co., Died Suddenly on Feb. 7. A biographical appreciation of Mr. Price was published in the July 1949 issue of Metal Progress, page 73. Mr. Price was a life member of the New Haven Chapter A.S.M.

Deep Drawing Process And Equipment Detailed

Reported by P. H. Ditzler
Leeds & Northrup Co.

A brief description of metal forming as practiced in the early days of history opened the talk on "Deep Drawing of Sheet Metal" presented before the Golden Gate Chapter A.S.M., meeting in San Francisco on Jan. 9. Charles F. Robie, president of the Gilro Machine and Stamping Co., was the speaker.

He sketched this early work done with the "red" metals and touched on the introduction of ferrous metals during medieval times, thus bringing the audience up to the real inception of pressed metal usage which occurred in the nineteenth century. Much of this early work would be extremely difficult to reproduce by any means today.

Mr. Robie then described the nature of the deep drawing process and the equipment used, including presses of all types, both hydraulic and mechanical. The various types of deep drawing, together with methods and die details, were illustrated by sketches and samples. The speaker discussed the problems in handling the different metals commonly in use, such as steel, stainless steel, aluminum, copper and brass, and offered recommendations for heat treatment and finishing.

The talk was concluded with recommendations on designing for deep drawing, and a few words of caution to those who might consider that the process would be a cure-all for their problems.

Scope and Importance Of Corrosion Increase With Industry Demands

Reported by E. R. Freeman
Kaiser Aluminum & Chemical Corp.

The scope and importance of corrosion are continually increasing, E. Wayne Everhart, corrosion engineer and metallurgist, division of metallurgical research, Kaiser Aluminum & Chemical Corp., said before the January meeting of the Inland Empire Chapter A.S.M. Mr. Everhart cited the chemical industry, with temperatures and pressures going higher and higher; the power equipment industry, with current or impending corrosion problems caused by higher steam pressure and the hot gases employed in gas turbines; and the oil industry, which spends millions upon millions of dollars each year to prevent corrosion—not only in large refineries, but in miles of pipeline.

Industry, whether ferrous or nonferrous, aircraft or automobiles, encounters corrosion problems on all sides. One way to reduce or to eliminate corrosion attack on metal is to isolate it from the corrosive media by some physical barrier such as an organic, metallic, or ceramic coating. Modern organic coatings include the phenolic resins, vinyl resins, chlorinated rubber, and specialty resins (synthetic rubber derivatives). The metallic coatings are usually hot-dip or electroplated materials.

Cathodic protection is another method for minimizing or virtually eliminating corrosion. It is widely used to protect many miles of buried iron pipe and power distribution lines, and is now receiving greater attention in the protection of hot and cold water tanks, superheaters, heat exchangers, and some marine equipment. The principle of its application is quite simple—it involves neutralization of the electric currents that operate between the many local anodes and cathodes of the metal surface.

As a general rule, the most desirable anodic materials exhibit a minimum of polarization with respect to time and current density. Magnesium, because of its high anodic position in the emf. series, is well suited for this purpose. Aluminum is another good anodic material for cathodic protection, and high-purity zinc is also useful. Aluminum is advantageous over many of the other metals, because it forms its own protective oxide film in the atmosphere as well as in many aqueous solutions.

The speaker concluded his talk with a number of lantern slides and a group discussion.

Various Technological Fields Require Metals With Special Properties

Reported by D. W. Grobecker
Metallurgical Engineer
Los Alamos Scientific Laboratory

Views of persons in different technological fields regarding the applications and properties—real and desired—of metals and alloys were brought forth in a round-table discussion held during the January meeting of the Los Alamos Chapter A.S.M.

J. Calvin Potts, chemist, acted as moderator, and skillfully conducted the discussion so that the opinions and problems of all the panel board members could be heard. The board included: Louis Goldstein, theoretical physicist; Berlyn Brixner, experimental physicist; Shelton A. Musser, construction engineer; Howard H. Belgorod, doctor of dentistry; William R. Oakes, doctor of medicine; Denton Doll, metallurgist; and Fred W. Schonfeld, metallurgist.

The audience participated actively in the discussion with detailed inquiries and suggestions for overcoming difficulties in the application of metals in the various technological fields.

For use with a high-speed revolving mirror assembly, Mr. Brixner said that he would like to obtain a metal which approaches infinite strength, ductility, light reflectivity, and fatigue resistance combined with a mass approaching zero. It was agreed by the audience that his application would not be the only use for such material. At the present time he has a relatively low alloy steel which has better than 300,000 psi. tensile strength with 40% reduction in area, and expects to increase these values to some extent.

Mr. Musser commented on the reduction in costs in the construction industry made possible by the improved properties and uniformity of constructional steels in the last few years.

The advantages and shortcomings of metals used for bridges, fillings and other dental applications were discussed by Dr. Belgorod. The dental profession, he said, desires a metal with a porcelain veneer capable of withstanding the severe requirements of strength, ductility, corrosion resistance, thermal expansion values, and thermal and electrical conductivity characteristics necessary for use within the mouth.

Dr. Oakes talked on the use of metals in the forms of plates, wires, and tubes for surgical replacement of organs, tissues, and bones within the body.

Dr. Goldstein completed the evening with an interesting dissertation on "superconductivity" exhibited by some metals at low temperatures. An explanation of this phenomenon would possibly help to explain the mysteries of electrical conduction, he pointed out.

Symposium Held on Carbide Tools

Speakers at a Symposium on Carbide Tools Held in Worcester, Mass., Are (Left to Right): Joseph B. Jacobs, Morgan Construction Co.; John Hayes, Draper Corp.; George R. Fullerton, Whitin Machine Works; and William P. Coomey, Rice-Barton Corp. (Photograph by C. Weston Russell)

More than 150 metallurgists and machine tool engineers heard a symposium on the use of carbide tools in the machining of metals in Worcester, Mass., on Jan. 10. The occasion was a joint meeting sponsored by the Worcester Chapters of American Society for Metals and the American Society of Tool Engineers.

The four speakers on the program all drew on their personal experiences with carbides in their plants. The four speakers were: Joseph B. Jacobs, methods engineer, Morgan Construction Co.; William P. Coomey, superintendent, Rice-Barton Corp.; John Hayes, chief tool engineer, Draper Corp., and George R. Fullerton, supervisor of tool control, Whitin Machine Works.

Carroll L. Morse of Heald Machine Co., vice-chairman of the local chapter of A.S.T.E., was program chairman, and Carl D. Schofield of Norton Co., A.S.T.E. chairman, presided. Orum R. Kerst of E. F. Houghton & Co., A.S.M. chapter chairman, also spoke briefly.

Apparatus Described for Studying Heat-Affected Zones in Arc Welds

Reported by Howard E. Boyer
Chief Metallurgist
American Bosch Corp.

A store of information resulting from years of research work in welding was presented before the Springfield Chapter A.S.M. on Jan. 16. "Weldability of Steels" was the subject of the talk delivered by Ernest F. Nippes, supervisor of welding research at Rensselaer Polytechnic Institute.

Dr. Nippes defined weldability as the capacity of a material to be satisfactorily welded and retain the properties necessary for the intended use. Dr. Nippes' presentation was focused primarily on the effects of the metal surrounding the welded area rather than on welding techniques. He emphasized the importance of effecting a definite maximum cooling rate which can be calculated from the plate thickness, original plate temperature, energy input, and the Jominy hardenability data of the steel being welded.

The speaker illustrated his lecture and described the apparatus he and his associates developed at Rensselaer for duplicating the heating and cooling cycles found in the heat-affected zones of arc welds. Results of his extensive research on specimens with simulated heat-affected zones serve to answer many questions relative to why welded joints fail from cracking — particularly in the strain-aged zones adjacent to the welded zones.

Bohan Joins Holden Co.

A. F. Holden Co. has announced the appointment of Lloyd J. Bohan as west coast representative. Before going to the Coast, Mr. Bohan was active in the Chicago Chapter A.S.M. and served as secretary-treasurer. For the past two years he has been a manufacturer's agent in Southern California, specializing in heat treating equipment.

Furnace Brazing Offers Fabrication Advantages And Improved Product

Reported by James Murray Hines

Sales Engineer, C. I. Hayes, Inc.

Proper application of furnace brazing not only results in economy of materials and labor, but provides lightweight construction with high strength and long life. H. M. Webber, applications engineer and furnace brazing specialist of General Electric industrial heating division, developed this theme in expert fashion at the December technical meeting of the Rhode Island Chapter A.S.M.

There is no universal rule exactly covering all factors and types of work, he said, but the important requirements are well known and readily applied. These include proper cleaning or degreasing of work; tight, smoothly fitting joints; assembling and setting up in such a manner as to assure proper relationship of parts; correct placing of brazing metal; and good furnace equipment with suitable protective atmosphere. Surfaces in the joint are sometimes rough finished or shot blasted to promote capillary action of the molten brazing metal.

A series of excellent color slides showed typical assemblies of stampings, metal punchings, tubing and screw machine parts furnace brazed to replace forgings, castings and heavy machined parts. Examples were drawn from the automotive, airplane, refrigeration, business machine and stove industries. Data charts showed how improved strength results in longer life over riveted or pinned assemblies. Relative strength of copper brazed joints as affected by varying tightness of fit was also shown on charts.

Most applications involve a combination of mild steel parts with copper as a brazing metal. An alloying effect between copper and iron "knits together" the two iron surfaces to form a strong bond. Carbon, alloy, and stainless steels can be brazed, with appropriate changes in furnace atmospheres. Some examples of cast iron and steel assemblies, and of brazing with silver, phosphorus, copper and brass alloys were described.

Various box, mesh belt and roller-hearth conveyor-type furnaces, with water-jacketed tunnels for heating and cooling work in protective atmosphere, were illustrated. Generators may be of exothermic, endothermic, or ammonia dissociator type.

Coffee talk was an amusing outline of "Skiing in These United States" by Frank C. Matzek, winter sports editor of the Providence *Journal* and *Evening Bulletin*.

NEW FILM

A documentary film is being produced by Transfilm Incorporated for the International Acetylene Association. This two-reel color motion picture will describe the basic story of the oxy-acetylene flame and show the development of welding as an industrial process.

The film will review the origin of oxygen and acetylene and their combination to produce the hottest flame known. It will show how oxy-acetylene has replaced the old forging process for joining metals.

Film Bibliography

The National Metal Trades Association has issued a new "Industrial Film Bibliography" listing 1400 motion picture and slide film training aids. Each film is fully described as to content, running time, availability, color, and sound. Sources from which the film may be bought, rented or borrowed are given. Nonmembers of the Association may secure the bibliography for $2 per copy by writing the National Metal Trades Association, 122 S. Michigan Ave., Chicago.

Uses of Ductile Iron Range From Plowshares To Gears and Crankshafts

Reported by F. R. Morral

Assoc. Professor, Syracuse University

Use of the two terms "ductile" or "nodular" cast iron is the subject of much discussion at the present time, G. L. Cox of the International Nickel Co. said in describing this new engineering material before the Syracuse Chapter A.S.M. on Feb 7. The word ductile seems to more nearly describe the material, he believes.

Mr. Cox compared the properties —foundry and mechanical—and the metallography with those of other well-known ferrous materials. While common mechanical properties are fairly well established, certain properties such as impact or shock resistance and corrosion behavior are under study. Effect of conventional alloying elements is not completely known as yet either.

Parts already made in production quantities from ductile iron include chilled plowshares, C-clamps, forging hammer anvils weighing several tons, pipe and pipe fittings. Examples of smaller machine parts are hitching links for farm machinery, clutch plates, ring gears, sprockets and gears, plug valves, commutators, circuit breakers, breeches of shotguns and crankshafts. Ample testing has indicated excellent results in the last-named application.

Questions covered in the discussion period that followed Mr. Cox's talk ranged over such aspects as how the process works, what addition alloys have given best results, cost comparisons with gray iron, effect of magnesium on Ni-Resist, effect of heat treatment, and the microstructure of chilled nodular iron.

Mo High Speed Steels Show Good Record as Substitute for Tungsten

Reported by W. J. Fretague

Research Assistant
University of Notre Dame

"Toolsteel — the Key to Efficient Production" was the title of the talk presented on Dec. 14 before the Notre Dame Chapter A.S.M. A. J. Scheid, vice-president in charge of metallurgy, Columbia Tool Steel Co., was the speaker.

Preceding the technical session, the chapter presented a portable typewriter to E. G. Mahin, past national trustee A.S.M., and past chairman and secretary, Notre Dame Chapter, in recognition of his efforts in behalf of the chapter and as a tribute to his outstanding career in metallurgical education.

Mr. Scheid prefaced the main portion of his presentation with a color motion picture showing the various stages in the production of toolsteels at the Columbia Tool Steel Co. He reviewed briefly the classification of the various types of toolsteels and commented on the merits of each particular type. Much valuable experience was gained during the war years on the use of the molybdenum high speed steels, and many toolsteel users found that these steels gave excellent performance in applications where tungsten high speed steels were specified previously.

The advantages and disadvantages of the various types of toolsteels must be kept in mind when specifying a material to do a particular job, he pointed out. In addition, material costs, anticipated tool usage, operating conditions and other related factors must be considered.

The majority of tool failures, Mr. Scheid said, can be attributed to heat treatment, involving not only temperatures used, but also changes in surface chemistry such as decarburization, carburization and nitriding. Improper grinding also accounts for many failures. All toolsteel producers furnish charts or tables that show the proper heat treating cycles for their various grades of steel, and if these recommendations are followed very little trouble will be encountered.

While increased advantage is being taken of improved equipment for treating toolsteel, to be effective it must be carefully maintained and frequently checked.

The speaker presented a series of photomicrographs of typical structures obtained in improperly heat treated toolsteels.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
W. H. Howell, Technical Abstractor

A GENERAL METALLURGICAL

31-A. Where Will We Get Our Future Metals? John D. Morgan, Jr. *Metal Progress*, v. 57, Jan. 1950, p. 56-58.

The strategic metals problem of the U. S. Charts show U. S. imports, secondary recovery, and mine production of ores of Al, Co, Cu, Fe, Pb, Mn, Mo, Ni, Sn, W, V, and Zn for the years 1938-46 inclusive. (A4)

32-A. Beryllium Hazards. *Metal Progress*, v. 57, Jan. 1950, p. 98, 100, 102, 104. Condensed from *U. S. Atomic Energy Commission*, MDDC-1355.

Results of a survey of conditions existing in late 1946 in a plant manufacturing Be and Be-Cu alloys were correlated with medical history of the workers during 1943-46. 136 cases of Be poisoning were recorded. The processes, potential hazards, and health history of the various departments. (A7, Be)

33-A. Metalworking to Have Good Year in 1950. *American Machinist*, v. 94, Jan. 23, 1950, p. 109-124.

Annual appraisal of metalworking prospects. (A4)

34-A. American Machinist 37th Annual Review of Metalworking Equipment, Parts and Materials. *American Machinist*, v. 94, Jan. 23, 1950, p. 125-268.

Classified review of 1500 new products of interest to the metalworking industries. Includes machine tools and attachments; tools and accessories; forming, forging, casting; welding and heat treating; layout and inspection; cleaning and finishing; plant service equipment; and parts and materials. (A general)

35-A. Indonesian Tin: Outlook for One of the New Nation's Major Products. Leo S. Peak. *Foreign Commerce Weekly*, v. 38, Jan. 23, 1950, p. 6-9, 41-42.

Economic analysis and forecast. (A4, Sn)

36-A. Metals—Heavy and Light. *Light Metals*, v. 13, Jan. 1950, p. 13-16. From paper by J. W. Meier.

Broad economic and technological factors such as availability, properties, amenability to fabrication, etc. Tables show world production, prices, and physical properties of common metals. (A4)

37-A. Foote Converts Schoolhouse Into Research Laboratory. Howard C. E. Johnson. *Chemical Industries*, v. 66, Jan. 1950, p. 36-37.

Research facilities of Foote Mineral Co. Emphasis is on lesser-known metals such as lithium and zirconium. (A9, EG-b)

38-A. Outlook in 1950 Optimistic for Materials, Supplies and Prices. N. Bruce Bagger. *Materials & Methods*, v. 31, Jan. 1950, p. 47-50.

Economic data for 1949 plus forecasts for 1950, in general and for steel, copper, lead, aluminum, tin, zinc, and plastics. (A4)

39-A. Review of Materials Engineering Developments in 1949. *Materials & Methods*, v. 31, Jan. 1950, p. 69-80.

Covers irons and steels; nonferrous metals; nonmetallic materials; fabricated parts and forms; coatings and finishes; cleaning and finishing; heat treating; welding and joining; and shaping and forming. (A general)

40-A. Aluminum—Magnesium—Titanium. A Quick Look at What Happened in 1949. *Modern Metals*, v. 5, Jan. 1950, p. 13.

A brief survey of economic developments. (A4, Al, Mg, Ti)

41-A. Iron Ore Review for 1949. A. L. Fairley, Jr. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 55-60.

Production data for the U. S. and Canada. (A4, Fe)

42-A. Requirements for Scrap and Pig Iron in 1949 at Prewar Level. Edwin C. Barringer. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 61-62.

Economic summary. (A4, Fe)

43-A. Year's Steel Output Third Largest in Peacetime Despite Strike. Walter S. Tower. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 62. (A4, ST)

44-A. Koppers Coke Oven Construction in North America in 1949. W. A. Leech, Jr. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 65-66.

New installations. (A4)

45-A. Fontana Plant Increases Tonnage Output and Diversifies Products. William A. Green. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 71-76.

Additional facilities include a second blast furnace, 45 coke ovens, a seventh openhearth, two soaking pits, a second slab furnace, an 86-in. hot-strip mill, and an electric-weld pipe mill. (A5, D general, F general)

46-A. Granite City Steel Co. Completes Strip and Tin Plate Mill Modernization. Charles Longenecker. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 83-86.

Includes rolling, annealing, pickling, and coating. (A5, F general, CN, Sn)

47-A. The Nickel Industry in 1949. Robert C. Stanley. *Canadian Chemistry and Process Industries*, v. 34, Jan. 1950, p. 59-60, 62.

An economic survey. (A4, Ni)

48-A. Economics of the Mineral Industry. Harry M. Crain, editor. *Quarterly of the Colorado School of Mines*, v. 45, Jan. 1950, 47 pages.

Papers presented Sept. 30, 1949, at Colorado School of Mines: "Mineral-Resource Appraisal by the U. S. Geological Survey", S. G. Lasky; "Oil and Human Welfare", Max W. Ball; and "Gold, Our Most Strategic Mineral", Donald H. McLaughlin. (A4, B10, Au)

49-A. Tight Copper Supply Position Seen Likely Despite High Rate of Operations at Mines. C. Donald Dallas. *Metals*, v. 20, Jan. 1950, p. 6, 13.

Economic forecast. (A4, Cu)

50-A. The Lead Industry in 1949. Simon D. Strauss. *Metals*, v. 20, Jan. 1950, p. 7, 9-13.

Economic survey and forecast. (A4, Pb)

Starting last month, a new method of classifying the annotations published in the A.S.M. Review of Current Metal Literature was adopted. The new system, developed by a joint committee of the American Society for Metals and the Special Libraries Association, was outlined in the February issue.

Annotations are segregated under 19 main subject headings, and each annotation is further coded by symbols indicating the subject matter in more detail. These symbols appear at the end of the abstract and should be referred back to the outline on pages 5 and 6 of Metals Review, *February issue. When both "processes and properties" and "materials" are coded, the processes and properties code symbols appear first, followed by the materials index coding.*

The new classification is particularly adapted to a punch-card method of filing literature references. A complete explanation of the system, together with equipment and supplies, will be available in the near future, and will be announced in Metals Review *at that time.*

51-A. Discussion on "The Disposal of Spent Acid Pickling Liquor". *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 85-87.

Refers to paper by W. B. Wragge in June 1949 issue. See item 15-49, 1949. (A8)

52-A. The Disposal of Plating Shop Effluents. A. E. J. Pettet. *Journal of Electrodepositor's Technical Society*, v. 25, 1950, p. 1-16. (Preprint.)

Source and nature of waste waters, and their effect on streams and on disposal of sewage. Treatments for chromates, cyanides, salts of heavy metals, and acid conditions. 21 ref. (A8, L17)

53-A. Institute Research Projects. Charles M. Parker. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 16-101.

Research in general. Outlines projects sponsored by AISI, and publications listed under the appropriate material or process heading. Includes bibliography of published reports. (A9, Fe)

54-A. Stream Pollution and Waste Disposal. Richard D. Hoak. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 209-220.

Stream pollution by domestic and industrial sewage. Treatment and federal regulation. (A7, A8)

55-A. Metallurgical Aspects of Steel Manufacturing in the West. J. H. Shank. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 318-327.

Supply and properties of ore, coal supply, scrap, the water problem, liquid fuels, rolling mills, and marketing as related to the above industry. (A4, ST)

56-A. Ferrous and Non Ferrous Metals—Testing. *ASTM Bulletin*, Jan. 1950, p. 8-10.

Surveys ASTM activities of 1949. (A general)

57-A. Metals in Review. *Engineering and Mining Journal*, v. 151, Feb. 1950, p. 76-99.

Economic aspects, price and production data. "Gold", M. A. Kriz (p. 76-79); "Silver", Dickson H. Leavens (p. 80-82); "Copper", H. H. Wanders (p. 82); "Lead", Robert L. Ziegfeld (p. 84-85, 87); tables and graph of metal prices, 1897-1949 (p. 86); "Zinc", Charles R. Ince (p. 87-89); "Tin", H. H. Wanders (p. 89-90); "Light Metals" (aluminum and magnesium), Richard J. Lund (p. 90-92); "Minor Metals" (in general), Charles White Merrill (p. 93); "Cobalt", Hubert W. Davis (p. 93); "Antimony", Samuel A. Gustavson (p. 93-94); "Arsenic", Jack W. Clark (p. 94); "Cadmium", Richard H. Mote (p. 94); "Bismuth", Jack W. Clark (p. 94); "Mercury", Helena M. Meyer (p. 94-95); "Beryllium", Jack W. Clark (p. 95); "Platinum-Group Metals", Hubert W. Davis (p. 95-96); "Titanium", Helena M. Meyer (p. 96); "Ferro-Alloy Metals" (in general), Charles White Merrill (p. 97); "Manganese", Norwood B. Melcher (p. 97-98); "Tungsten", Hubert W. Davis (p. 98); "Chromite", Norwood B. Melcher (p. 98-99); "Molybdenum", Hubert W. Davis (p. 99); and "Nickel", Hubert W. Davis (p. 99). (A4)

58-A. Regeneration of Chromic Acid Solutions by Cation Exchange. Raymond L. Costa. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 308-311.

Solutions that have been rendered useless by the accumulation of dissolved metals, such as Al, Cu, and Fe, are regenerated by passing through a cation-exchange resin. 10 ref. (A8)

59-A. Activities of the Steel Industry in Abating Air Pollution. L. B. Patin. *Solid Fuel Engineer*, v. 9, Jan. 1950, p. 7-9.

Survey with special attention to the situation in Pittsburgh and Allegheny County, Pa. (A7, Fe)

60-A. Metallurgy: Publications by Members of the Staff of the National Bureau of Standards. *Bureau of Standards*, Letter Circular, LC964, Sept. 27, 1949, 28 pages.

List gives series, number, and price. Includes subject and author indexes. (A10)

61-A. Activities of the French Metallurgical Research Institute. (In French.) George Delbart. *Revue de Métallurgie*, v. 46, Nov. 1949, p. 775-778.

Activities of the above, known as I.S.R.I.D. A list of publications for 1948-49 is included. 24 ref. (A9)

62-A. The Organization of Iron and Steel Research in France. G. Delbart. *Metal Progress*, v. 57, Feb. 1950, p. 208-210.

See abstract from *Revue de Métallurgie*, item 61-A, 1950. (A9, Fe)

63-A. History of Premium Price Plan for Copper, Lead, and Zinc. 1942-47. H. E. Olund and S. A. Gustavson. *U. S. Bureau of Mines*, Information Circular 7536, Jan. 1950, 210 pages.

Includes charts and tables comparing costs and production data, and data on exploration premiums included in the Plan during the last year of its operation. (A4, Cu, Pb, Zn)

64-A. Bureau of Mines Strategic Minerals Development Program; Summary of Progress, 1939-1949. Lowell B. Moon. *U. S. Bureau of Mines*, Report of Investigations 4647, Jan. 1950, 62 pages.

Authority, objectives, funds, and procedure of the program. Data on resources, consumption, etc. Progress by commodities investigated. (A4, B10)

65-A. The Disposal of Spent Acid Pickling Liquor. I. Compositions and Various Methods Described. W. B. Wragge. *Wire Industry*, v. 17, Jan. 1950, p. 45-47, 49-50.

Economics and technology of disposal. Graphs, flow diagrams, and equilibrium diagrams for the $FeSO_4$-H_2SO_4-H_2O system. (To be continued.) (A8, L12)

66-A. (Book) **Repertorio delle Industrie Siderurgiche Italiane.** (Directory of Italian Iron and Steel Industries.) Associazione Industrie Siderurgiche Italiana (Italian Iron and Steel Federation), Piazza Rugabella N. 13, Milan, Italy. $5.50.

Reviews Italian firms engaged in primary and secondary production of iron and steel. Descriptions, dimensions, and quality of products manufactured by these concerns. Conversion tables of measures, along with an iron and steel dictionary in five languages. (A10, Fe)

B

RAW MATERIALS AND ORE PREPARATION

22-B. Recovery of Manganese From Low Grade Ores. *Iron Age*, v. 165, Jan. 19, 1950, p. 81-82. Based on paper by R. D. Hoak and J. Coull.

Process which involves leaching with waste pickle liquor. An oxide concentrate low in impurities and containing upwards of 60% Mn is produced. (B14, Mn)

23-B. The Swedish Iron and Steel Industry. H. U. Ross. *Canadian Mining Journal*, v. 71, Jan. 1950, p. 49-54.

Fuel supply, mining, concentration, and various steelmaking processes. (B general, D general, Fe)

24-B. Electric Heating of Screens. G. W. Craiglow. *American Ceramic Society Bulletin*, v. 29, Jan. 1950, p. 27-29.

Clogging during sizing of materials from the standpoint of its solution with electrically heated screens. While experience has been limited to the ceramic industry, similar conditions exist in chemical, coal, steel, cement, and other industries. (B13)

25-B. South African Source of Uranium. *Chemical Age*, v. 61, Dec. 10, 1949, p. 791-792.

Possible recovery of uranium from the Rand ores. (B10, U)

26-B. Tomorrow's Ore. Edward H. Wisser. *Mining Congress Journal*, v. 36, Jan. 1950, p. 26-30; discussion, p. 31-32, 42.

Basic factors to be considered in the search for new ore deposits. The author and the discussers are unanimous in the opinion that many undiscovered ore bodies still exist in the U. S. (B10)

27-B. Laboratory Concentration of Mercury Ores From Oregon, California, Idaho, and Nevada. R. R. Wells. *U. S. Bureau of Mines*, Report of Investigations 4620, Jan. 1950, 19 pages.

Results of beneficiation studies on ores submitted from 1941 to 1947. (B14, Hg)

28-B. Titanium and Iron Minerals From Black Sands in Bauxite. W. A. Calhoun. *U. S. Bureau of Mines*, Report of Investigations 4621, Jan. 1950, 17 pages.

Methods of recovering Ti and Fe minerals in waste products from Arkansas ores. Screening, tabling, and magnetic separation were used. (B general, Ti, Fe)

29-B. Progress in Research. *Mineral Industries Experiment Station, Pennsylvania State College*, Bulletin No. 53 (Biennium 1947-1949, v. 43, Oct. 21, 1949), 62 pages.

Summary for 1947-1949. Includes mineral beneficiation, petroleum, natural gas, earth sciences, minerals, glass, and fuels. (B general)

30-B. Influence of Composition and Structure of Zinc Blende on Flotability. (In Russian.) I. N. Plaksin, G. N. Khazhinskaya, and T. F. Brovkina. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR) (Section of Technical Sciences), Sept. 1949, p. 1361-1364.

Flotability of sphalerites from different deposits was investigated. It was found that Fe content is one of the factors increasing flotability. (B14, Zn)

31-B. The Beneficiation of Northern Iron Ores. Francis X. Tartaron. *American Iron and Steel Institute* "Technical Committee Activities", 1949, p. 115-128.

Various methods and future prospects. (B14, Fe)

32-B. The Beneficiation Methods for Southern Iron Ore. E. H. Rose. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 221-242.

Deals with ores of the Birmingham, Ala., district. Geology, nature of ore, comparison with Lake Superior ores, and various methods of concentration and separation. (B14, Fe)

33-B. Conditioning Blast Furnace Slag for Commercial Use. Fred Osborne. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 252-263.

Various handling, cooling, crushing, and screening procedures. Applications. (B21, Fe)

34-B. The Effect of Increased Clas-

sification Capacity at the Allenby Concentrator. Walter I. Nelson and Harvey Armes. *Canadian Mining and Metallurgical Bulletin*, v. 43, Jan. 1950; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 53, p. 27-32.

New equipment layout for copper concentrator. Comparative results before and after the classifier change. (B13, Cu)

35-B. The First Two Years of Milling at Renabie. E. G. Kearney. *Canadian Mining and Metallurgical Bulletin*, v. 43, Jan. 1950; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 53, p. 37-44.

Concentration flowsheets and procedures at Ontario gold-mining property. The ore; the milling practice; early ore-dressing investigations; the crushing plant; cyanidation; crushing; flotation; and refining. (B13, B14, Au)

36-B. Iron Ore Beneficiation Leads Advance in Milling. *Engineering and Mining Journal*, v. 151, Feb. 1950, p. 116-119.

Review of 1949 developments. (B14, Fe)

37-B. Iron Ore in 1949. *Skillings' Mining Review*, v. 38, Jan. 28, 1950, p. 1, 4-5.

Production data for various U. S. producing districts. (B10, A4)

38-B. Styrian Iron Ore Production Increasing Due to Austrian Iron and Steel Plan. Joseph Oberegger. *Steel*, v. 126, Feb. 6, 1950, p. 102, 104.

Extensive program of installing modern equipment for Austrian mine will be completed sometime during 1951. (B10, Fe)

39-B. Cerro Bolivar: Saga of an Iron Ore Crisis Averted. T. W. Lippert. *Mining Engineering*, v. 187, Feb. 1950, p. 178-192; *Journal of Metals*, v. 188, Feb. 1950, p. 222-236.

The new Venezuelan iron-ore discovery of U. S. Steel. History of its discovery and investigation. Depletion of the Lake Superior ores and of the work being done on taconite beneficiation and on exploitation of other new deposits in Labrador, Quebec, and elsewhere. (B10, Fe)

40-B. Effect of Conditioning on Flotation of Chalcocite. S. B. Tuwiner and S. Korman. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 197, Feb. 1950, p. 226-238.

Development of a method for determining thickness of the fluid film upon a polished surface of synthetic chalcocite, to serve as a quantitative evaluation of agitation. Study of minimum collector concentration vs. agitation intensity; effects of dissolved oxygen and sodium sulfide and their electrochemical behavior; oxidation of sulfides in pulps. (B14, Cu)

41-B. Canadian Deposits of Uranium and Thorium. W. F. James, A. H. Lang, Richard Murphy, and S. N. Kesten. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 187, Feb. 1950, p. 239-255.

Information up to the end of 1948. 22 ref. (B10, Th, U)

42-B. Alumina by the Bayer Process. *Industrial Chemist and Chemical Manufacturer*, v. 25, Sept. 1949, p. 431-438.

Plant operated by British Aluminium Co., Ltd. Comminution of the ore, alkaline digestion, removal of silica, and precipitation of hydrate of alumina. (B14, Al)

43-B. Flotation of Lake Superior District Iron Ores. Fred D. DeVaney. *Skillings' Mining Review*, v. 38, Feb. 11, 1950, p. 1, 4, 6, 15.

New developments since 1947. (B14, Fe)

44-B. Report on the Re-Treatment of Tailings Dump at Evanston Gold Mines, Evanston, W. A. Progress Reports No. 1 and 2. *Joint Investigations of the Council for Scientific and Industrial Research and the Kalgoorlie School of Mines, Kalgoorlie Metallurgical Laboratory* (Kalgoorlie, Australia), Report No. 396, Parts 1 and 2, Mar. 14, 1949, 6 and 7 pages.

Extraction of 3.57 dwts. gold per ton may be expected from tailings with a head value of 5.94 dwts. per ton. (B14, Au)

45-B. The Effect of Surface-Agents on Fine Grinding. (In German.) Eugen Von Szantho. *Zeitschrift für Erzebergbau und Metallhüttenwesen*, v. 2, Dec. 1949, p. 353-359; discussion, p. 359-360.

Wet-grinding experiments show that addition of surface agents favorably affects the grinding of ores, and that a proper concentration of flotation agents can increase the surface of the ground material by more than 100% without increasing the energy consumption. In the grinding of complex ores, specific agents can have selective effect on the grinding operation. 13 ref. (B13)

46-B. Highly Flexible Beneficiation Plant Handles Mesabi Ore Successfully. E. S. Tillinghast. *Mining World*, v. 12, Feb. 1950, p. 33-34.

Plant at Longyear Mine, east of Hibbing, Minn. (B14, Fe)

47-B. Kinetics of Processes of Roasting, Leaching, Washing, and Cementation. (In Russian.) S. L. Rotinyan and B. V. Drozdov. *Zhurnal Obshchei Khimii* (Journal of General Chemistry), v. 19(81), Oct. 1949, p. 1843-1852.

Formulas are derived. Despite differences of these processes, they may all be incorporated into one general relationship, based on calculation of the gradual increase of thickness of the diffusion layer proportional to the amount of reacted diffusing substance. 10 ref. (B general)

48-B. Investigation of the Processes of Calcination and Reduction of Nickel Hydrosilicates by Carbon. (In Russian.) D. P. Bogatskii. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Oct. 1949, p. 1512-1525.

Experimentally investigated from several theoretical and practical viewpoints. Methods of investigation and data (B15, Ni)

49-B. Refractory Linings for Induction Furnaces. H. J. Chesters, J. Mackenzie, and L. Lee. *Ceramic Age*, v. 54, Nov. 1949, p. 280, 282-283; Dec. 1949, p. 374-375.

A condensation. See abstract of "Steel-Tight Linings for Basic Induction Furnaces", *Transactions of the British Ceramic Society*, item 17-83, 1949. (B19, D6)

50-B. (Book) Minerals and Mineral Deposits. W. R. Jones and David Williams. 248 pages. 1948. Oxford University Press, London.

History, shape, internal structure, physical characteristics, mode of occurrence and importance of minerals. The part that mineral deposits play in international affairs. (B10)

C

NONFERROUS EXTRACTION AND REFINING

9-C. Continuous Casting of Brass Slabs. Harold J. Roast. *Metal Progress*, v. 57, Jan. 1950, p. 51-55.

Equipment and procedure at new mill of Scovill Mfg. Co. for production of coiled brass strip in extra long lengths. Includes detailed diagrams of the melting and casting equipment. (C5, Cu)

10-C. Pig Iron and Pigment. *Chemical Industries*, v. 66, Jan. 1950, p. 24.

Ilmenite will be converted to pig iron and high-Ti slag in new electric smelter at Sorel, Quebec. The latter will be used for production of Ti concentrates for pigment or metal production. (C21, Fe, Ti)

11-C. Mercury in Chemical Metallurgy. H. Hohn. *Research*, v. 3, Jan. 1950, p. 16-23.

The term "amalgam metallurgy" describes certain new processes developed in Germany. Several pilot plants have been in operation; and a full-scale plant for production of pure zinc from roasted pyrites was built. Amalgam metallurgy enables low-grade complex ores to be used. Applicability to a wide range of metals. 41 ref. (C29)

12-C. Lead Smelting in the Ore Hearth. III. Zonal Action in the Smelting Column. G. L. Oldright. *U. S. Bureau of Mines*, Report of Investigations 4591, Jan. 1950, 43 pages.

Correlates composition of gases prevailing in the charge column at various elevations with the nature of the charge column, tracing the steps by which PbS is converted into metallic lead. (C21, Pb)

13-C. The Removal of Magnesium From Aluminum Alloys. (In German.) Kurt Schneider and Eugen Berblinger. *Zeitschrift für Metallkunde*, v. 40, Nov. 1949, p. 411-417.

Comparison of different methods shows that treatment with chlorine is the most economical method. Experimental data and refining costs. (C4, Al)

14-C. 1949 Was a Year of Progress in Non-Ferrous Metallurgy. A. W. Schlechten. *Engineering and Mining Journal*, v. 151, Feb. 1950, p. 120-124.

Reviews 1949 developments. Emphasis on Ti, Zr, Cu, Ni, Pb, and Zn. (C general, EG-a)

15-C. Developments in the Application of Activated Carbon to Cyanidation, Including the Desorption of Gold and Silver From Carbons. E. H. Crabtree, Jr., V. W. Winters, and T. G. Chapman. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 187, Feb. 1950, p. 217-222.

Experimental and pilot-plant work completed since 1939, including various methods developed in applying coarse activated carbon to cyanidation. Methods and results developed for desorbing gold and silver from carbons, and possibilities for re-use of the desorbed carbons. (C24, Au, Ag)

16-C. Continuous Countercurrent Decantation Calculations. T. B. Counselman. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 187, Feb. 1950, p. 223-225.

Shortcut method for making above calculations used in cyanidation and by chemical engineers. The method is said to be particularly valuable in selecting the best of several possible flowsheets, and in evaluating the effects of various assumptions. (C24, Au, Ag)

17-C. Preparation and Properties of Titanium-Base Alloys. P. H. Brace, W. J. Hurford, and T. H. Gray. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 227-236.

With particular reference to behavior in cast form at high temperatures. The alloys were prepared by melting and casting in vacuum under an argon atmosphere. Experiences with various refractories. Design and manufacture of molds for producing cast specimens for tensile

test. Quantitative tensile data at several elevated temperatures and some information concerning oxidation characteristics. (C25, Q27, Ti)

18-C. Titanium Tetra-Iodide; Preparation and Refining. Warren B. Blumenthal and Howard Smith. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 249-251.

History of TiI_4 and a new method for its preparation. The compound is of especial interest in Ti metallurgy because it may be decomposed thermally to yield Ti metal. The procedure also has value for qualitative and quantitative determination of metallic Ti. 19 ref. (C4, Ti)

19-C. Production of Malleable Zirconium. W. J. Kroll and W. W. Stephens. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 395-398.

A pilot plant for production of 300 lb. of Zr sponge per week in operation at the U. S. Bureau of Mines station in Albany, Ore. Steps are as follows: arc-furnace smelting of ore or concentrate with carbon to produce impure carbide; chlorination to $ZrCl_4$; purification and densification by sublimation; reduction by Mg and purification of the resulting sponge by fusion and vacuum distillation; and vacuum melting to produce ingots. (C21, C25, Zr)

20-C. Scovill Brass Plant Features Continuous Processes. *Iron and Steel Engineer*, v. 27, Jan. 1950, p. 90-92.

Continuous casting of brass. (C5, Cu)

21-C. Continuous Casting Machine Increases Mill Production. *Machine Design*, v. 22, Feb. 1950, p. 143-145.

New brass strip mill of Scovill Manufacturing Co. (C5, Cu)

22-C. Results of Research on Metal-Slag Reactions. (Concluded.) Willy Oelsen. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, Dec. 1949, p. 368-371.

The metallurgy of Cb and Ta. Surveys the literature on the equilibria between metal melts and sulfide slags. Reducing effects of Mn, soda, and sodium metasilicate. (C21, Cb, Ta)

23-C. Mechanism and Kinetics of Oxidation of Lead Sulfide by Oxygen. (In Russian.) D. M. Chizhikov, G. S. Frents, and B. Ya. Tratsevitskaya. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR) (Section of Technical Sciences), Sept. 1949, p. 1352-1360.

Character and sequence of basic chemical reactions occurring during the process. Method of the investigation and data. (C21, Pb)

24-C. The Reaction Between Magnesia and Carbon Monoxide. (In Russian.) D. M. Chizhikov, E. I. Khazanov, and A. G. Nikonov. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Oct. 1949, p. 1493-1500.

The "carbothermic" reduction of metals with carbon or CO, and the types of metals to which it is applicable. Reduction of MgO by means of Al, CaC_2, C, Si, and SiC, giving required temperatures and pressures. Reduction using CO. (C21, Mg)

D

FERROUS REDUCTION AND REFINING

19-D. Hot Top Efficiency Improved. J. W. Mueller and G. A. Bole. *Steel*, v. 126, Jan. 23, 1950, p. 80, 82, 84.

Hot tops with substantially reduced volumes are expected in the near future as a result of recent investigations with light-weight refractory materials and insulating covers on 3x3 to 25x25-in. steel ingots. Experimental results. (D9, ST)

20-D. Review of Open Hearth Practice. E. G. Hill. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 63-64.

Reviews 1949 developments. (D2)

21-D. Developments in the Steel Plant Combustion Field. H. V. Flagg. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 67-70.

Developments in fuels and furnaces. (D general)

22-D. Development of the Electric Furnace Industry During 1949. W. J. Reagan. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 81-82, 139.

As applied to steelmaking. (D5)

23-D. Arc Furnace Operation and Equipment. A. R. Oltrogge. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 87-98, 139.

Reviews electrical steel melting and refining with respect to furnace performance. (D5)

24-D. Iron and Steel Plant Refractories. Emil B. Guenther. *Blast Furnace and Steel Plant*, v. 38, Jan. 1950, p. 100-101, 135.

Selection of the above. (D general)

25-D. Reduction of Sulphur in Iron and Steel; Recent Spanish Results. *Chemical Age*, v. 62, Jan. 7, 1950, p. 20. From paper by A. Gimenez y Sanmartin, *DYNA*, v. 24, 1949, p. 117-121.

Study of the Perrin process. (D2, D5)

26-D. Influence of Certain Production Factors on Properties of Carbonaceous Rammed Masses. (In Russian.) A. A. Pirogov and V. P. Rakina. *Ogneupory* (Refractories), v. 14, Sept. 1949, p. 402-413.

Influences of quality and quantity of binder, quality of coke, fineness of grinding of carbonaceous materials, degree of packing, and preliminary heat treatment on properties of carbonaceous masses for lining blast furnaces. Two types of mass, from coke and from anthracite, were investigated. (D1)

27-D. Manganese Research. Charles H. Herty, Jr. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 202-208.

Uses of Mn in steelmaking and its effects on surface quality and other properties; also its use as a deoxidizer. (D general, Mn)

28-D. Cold Charge Practice in Open Hearth Operations. O. A. Kresse. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 302-306.

Scrap preparation, sulphur control, quality maintenance, and charges for sheet products in steel production. (D2)

29-D. Five Years of Blast Furnace Operation Under Elevated Top Pressure. Frank Janecek. *Iron and Steel Engineer*, v. 27, Jan. 1950, p. 55-61; discussion, p. 61-62.

Further operational experience with pressure blowing of blast furnaces which bears out earlier claims for higher production, greater coke economy, and less flue dust. (D1)

30-D. Inductive Stirring in Arc Furnaces. Sven Fornander and Folke Nilsson. *Journal of Metals*, v. 188, Jan. 1950, p. 22-29; Feb. 1950, p. 256-256D.

A new type of stirring device to accelerate metallurgical reactions in steelmaking arc furnaces. History of inductive stirring, type of equipment used in latest experiments, and results during the melting-down period; power consumption for melting, the oxidizing period, and slag removal. Concluding installment: Factors developed during the reducing period, specific effects on refractory linings, and economic aspects. (D5)

31-D. Effect of Melting Practice on Hydrogen. Sam F. Carter. *Journal of Metals*, v. 188, Jan. 1950, p. 30-40; Feb. 1950, p. 245-255.

A number of quantitative hydrogen analyses of some electric arc-furnace steels with varied melting practices. Causes and effects of hydrogen in steel; procedures used in this investigation; results for carbon steels. 28 ref. (D5, H)

32-D. The Use of Radiocalcium To Study the Distribution of Calcium Between Molten Slags and Iron Saturated With Carbon. W. O. Philbrook, Kenneth M. Goldman, and Martha M. Helzel. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 361-367.

Radioactive calcium was used to learn whether Ca can be detected in iron saturated with carbon after melting under CaO-Al_2O_3-SiO_2 slags similar to those used in the iron blast furnace. No Ca could be found in the metal under conditions which were favorable for its reduction by calcium, and its was concluded that the Ca content was less than $6x10^{-5}$ %. Some of the problems encountered indicate certain pitfalls and limitations of tracer methods. 12 ref. (D1, S19, Fe)

33-D. The Solubility of Oxygen in Liquid Iron Containing Aluminum. D. C. Hilty and Walter Crafts. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 414-424.

Solubility was determined at 1550, 1600, and 1650° C. and found to be much higher than predicted from theoretical considerations, possibly due to equilibria with an Fe-Al spinel phase rather than pure Al_2O_3. The presence of Mn greatly increased the deoxidizing power of Al. 23 ref. (D general)

34-D. Solubility of Oxygen in Liquid Iron Containing Silicon and Manganese. D. C. Hilty and Walter Crafts. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 425-436.

Determination of the solubility of O_2 in iron containing Si or Mn or both confirmed earlier work on Si, showed that manganese is more effective than expected, and demonstrated that the combination of Si and Mn is a much stronger deoxidizer than might have been inferred from individual effects. 18 ref. (D general)

35-D. Increasing Open Hearth Production by Use of Oxygen, Better Refractories and Control of Slag. II. and III. Erle G. Hill. *Industrial Heating*, v. 16, Dec. 1949, p. 2222, 2224, 2226, 2228-2229; v. 17, Jan. 1950, p. 128, 130, 133.

Previously abstracted from *American Iron and Steel Institute*, Preprint, 1949. See item 2B-151, 1949. (D2)

36-D. Factors Affecting Steel Quality in the Open Hearth. *Industrial Heating*, v. 17, Jan. 1950, p. 80, 82, 84, 86, 88, 176.

Summarizes several papers presented at National Open Hearth Steel Committee's 32nd annual conference sponsored by AIME. (D2)

37-D. A Contribution to the Problem of Inclusions in Steel. (In Czech.) Vl. Zednik. *Hutnické Listy*, v. 4, Oct. 1949, p. 319-324; Nov. 1949, p. 360-363.

Various methods for quantitative determination. Importance of melting technique, erosive effect of steel on ladle refractories, and character

and amount of inclusions. Interesting behavior of steel which was successfully deoxidized by means of calcium silicide. 23 ref. (D general)

38-D. Statistical Study of Ingot Molds. (In French.) P. Rocquet. *Revue de Métallurgie*, v. 46, Nov. 1949, p. 755-757.

Relationship between the composition of the molds and their service life. (D9)

39-D. Study of the Blast in Bessemer Converters by Means of a Volumetric Instrument. (In French.) R. Michaux, P. Leroy, F. Meyers, and F. Renard. *Revue de Métallurgie*, v. 46, Nov. 1949, p. 779-796.

Instrument developed for determination of blast output as a function of total volume of forced air. Method of operation and potentialities for study of blast-furnace operation. (D3)

40-D. Concerning the Reduction of Iron Oxides in the Melt. (In German.) Ernst Justus Kohlmeyer. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 345-347.

Reduction of Fe_2O_3 and its mixtures with other metal oxides by melting them in the carbon crucible. With equal temperatures, rate of reduction depends on heat of formation of the oxides, their melting points, and solubility of the reduced metals in the molten iron. The significance of the unstable Fe-CO complex in the formation of blast-furnace dust and in corrosion of the roof of the openhearth furnace. The process can be used to reduce Al_2O_3 to metallic Al. (D general)

41-D. Dephosphorization of Iron Alloys With Alkali- and Alkaline-Earth Metals, Especially With Magnesium. (In German.) Wilhelm Anton Fischer and Josef Heyer. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 369-374.

Phosphorus was extracted—mostly in the form of gaseous hydrogen phosphide—from iron alloys, ferrophosphorus containing about 22% P, and ferromanganese with 2.6% P and 66% Mn by heating in closed iron crucibles with Mg at different temperatures, followed by washing the reaction product with water. Tests made with 200 times larger charges in a revolving cylindrical furnace under a protective atmosphere of hydrogen confirmed the results. (D general, C general, Mn)

42-D. The British Iron and Steel Industry in 1949. *Engineer*, v. 189, Jan. 13, 1950, p. 61-63; Jan. 20, 1950, p. 74-76.

Steelmaking and primary fabrication developments. (D general)

43-D. Additions for Converter Treatment of a Steel Containing 3% Nickel, 0.8% Chromium, and 0.35% Molybdenum. (In French.) Etienne Sautereau. *Fonderie*, Nov. 1949, p. 1840.

Recommended compositions and methods for introduction of alloying additions. (D3, AY)

E

FOUNDRY

32-E. Precision Casting Provides Low-Cost Production of Small, Intricate Parts. A. H. Allen. *Steel*, v. 125, Dec. 26, 1949, p. 50-52, 67.

Process and typical applications to steel parts. (E15, ST)

33-E. Producing As-Cast Ferritic Nodular Iron in Heavy Sections. Albert De Sy. *Metal Progress*, v. 57, Jan. 1950, p. 79.

Solid cylinders and a hollow cylinder were cast from a 4-ton ladle. Composition of the iron and of the nodulizing addition. Structures and tensile properties. (E25, CI)

34-E. Triple-Groove Sheave Casting Presents Rigging Problems; Gating and Risering Committee Makes a Survey. N. A. Birch, Chairman. *American Foundryman*, v. 17, Jan. 1950, p. 25-30.

The problem was presented to a large number of gray-iron foundries. The 65 replies are classified as center-gaters, edge-gaters, and nonconformists. The committee also made some test castings to decide whether or not risers are necessary. Typical suggested rigging arrangements. (E22, CI)

35-E. Modern Foundry Methods: Centrifugal Casting of Welding Rods. *American Foundryman*, v. 17, Jan. 1950, p. 44-47.

The rods consist of an overlay alloy facing metal used in hard-facing oil-drilling tools. (E14, T5)

36-E. Basic Principles Common to Foundry Melting Practices. Philip C. Rosenthal. *American Foundryman*, v. 17, Jan. 1950, p. 48-55.

Refining of steel during melting; slags and fluxes; deoxidizing the melt; inoculants as deoxidizers; grain-size control, gas removal by boiling or agitation; gas removal by reaction; melting under oxidizing conditions; elimination of hydrogen by gas reaction; other gas-removal methods; and avoidance of gas in castings. 13 ref. (E10, E25)

37-E. How To Select Proper Squeeze Piston Size in Molding Machines. Walter W. Eichenberger. *American Foundryman*, v. 17, Jan. 1950, p. 56-57.

Nomograph plus descriptive material. (E19)

38-E. All-Mechanical Shakeout Unit Designed. *American Foundryman*, v. 17, Jan. 1950, p. 68. From article in *Iron and Steel*, v. 22, Aug. 1949. (E24)

39-E. Moulded Pattern Plates. James Timbrell. *Pig Iron Rough Notes*, Autumn-Winter 1949-50, p. 3-13.

Recommended arrangements. (E17)

40-E. Blast Preheating for Foundry Cupolas. Ralph L. Melaney. *Industrial Gas*, v. 28, Jan. 1950, p. 6, 22, 24-25.

Recommendations. (E10)

41-E. Casting the Large Statue of Washington. Pat Dwyer. *Foundry*, v. 78, Feb. 1950, p. 70-75, 231-233.

Procedures and equipment used in plaster casting a huge bronze figure of George Washington to be unveiled at Alexandria, Va. (E16, Cu)

42-E. A Simple Fracture Test for Melt Quality of Bronze Castings. James O'Keefe, Jr., and Howard F. Taylor. *Foundry*, v. 78, Feb. 1950, p. 94-96, 234-237.

A simple test piece which will determine if unsoundness is caused by shrinkage, improper melt quality, or gas pickup from wet or unsatisfactory molds. Visual examination of a fractured V-block; transverse X-ray of a thin slab cut from the test casting; Zyglo tests; or pressure tests are suitable criteria of soundness. (E25, Cu)

43-E. Solidification of Molten Metal. Norman F. Hindle. *Foundry*, v. 78, Feb. 1950, p. 97, 222-225.

Mechanism of metal solidification and its effect on properties and design of castings. 10 ref. (E25)

44-E. Flasks and Rigging for Steel Castings. (Concluded.) John Howe Hall. *Foundry*, v. 78, Feb. 1950, p. 98-99, 135, 137-138.

How to calculate the lifting force of molten metal on the cope and cores. (E22, CI)

45-E. Casting Centrifugally in Graphite Molds. John Putchinski. *Foundry*, v. 78, Feb. 1950, p. 132, 135. Reprinted from *International Digest* (International Graphite & Electrode Corp., St. Mary's, Pa.).

Method used for a wide variety of ferrous and nonferrous castings at Allis Chalmers Mfg. Co. (E14)

46-E. Casting Alloys for Permanent Magnets. Thomas A. Dickinson. *Foundry*, v. 78, Feb. 1950, p. 146, 148, 150.

Previously abstracted from *Steel*. See item 12-E, 1950. (E11, SG-n)

47-E. Crane Drum Molded and Poured on End. Pat Dwyer. *Foundry*, v. 78, Feb. 1950, p. 158-159.

Molding and casting a 30-ft. drum weighing 19,950 lb. (E19, CI)

48-E. Production of Gray Iron Castings. R. L. Collier. *Steel*, v. 126, Jan. 23, 1950, p. 64-66, 68, 70, 73-74, 76.

Procedures and equipment. Varied applications. (E general, CI)

49-E. Production Control in a B. C. Foundry. R. M. Dyke. *Canadian Metals*, v. 13, Jan. 1950, p. 24-27.

Inoculant method of process control provides five basic specifications of gray iron from a single heat. Each specification can be modified by alloying and heat treatment. (E25, CI)

50-E. Antipiping Compounds for Steel Castings. S. L. Gertsman. *Canadian Metals*, v. 13, Jan. 1950, p. 30-33, 46.

Study of the insulating and mildly exothermic types of compound. Several of these materials in common use were submitted to a series of tests using induction-melted mild steel. Details of method, which can be readily applied by the average foundryman. (E25, CI)

51-E. Fluidity of Metals; A Review of Test Methods and Results. J. E. Worthington. *Iron and Steel*, v. 22, Dec. 1949, p. 615-619; v. 23, Jan. 1950, p. 9-11.

32 ref. (E25)

52-E. Controlling Porosity; More Jobbing Foundry Experiences. Tubal Cain. *Iron and Steel*, v. 23, Jan. 1950, p. 8.

Experiences with high-duty iron. (E25, CI)

53-E. Foundry Cores and Moulds; Vapours and Fumes Evolved From Organic Bonding Materials. W. M. Lord. *Iron and Steel*, v. 23, Jan. 1950, p. 21-25.

Surveys the literature. (E18)

54-E. Convection in Molten Metals. (In Russian.) L. I. Sokol'skaya. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR) (Section of Technical Sciences), Sept. 1949, p. 1365-1371.

Above was studied experimentally with particular reference to convective transfer of molten metal after pouring into the mold. (E23)

55-E. How Design Is Affected by Foundry Practice. Oliver Smalley. *Product Engineering*, v. 21, Feb. 1950, p. 117-121.

Ten basic rules for design of sand-cast metal parts. Specific rules relating to shape and size of parts, plus reasons for the influence of casting problems on product design, such as shrinkage allowance. (E11)

56-E. Die Casting Die Design. Part IV. (Continued.) L. K. Barton and James L. Erickson. *Tool & Die Journal*, v. 15, Feb. 1950, p. 54-56, 58, 96.

Recommended design of a water-cooled sprue post. (To be continued.) (E13)

57-E. Grain Refinement of Aluminium and Its Alloys by Small Additions of Other Elements. Myriam D. Eborall. *Journal of the Institute of Metals*, v. 76, Dec. 1949, p. 295-320.

It was found that Ti, Zr, and V are the most effective grain refiners of pure aluminum, but that boron refines the grain of the Cu-bearing

alloys, its efficiency increasing with Cu content. Effects of pouring temperature and method of addition. 29 ref (E26, Al)

58-E. The Mechanism of Grain Refinement of Sand Castings in Aluminum Alloys. A. Cibula. *Journal of the Institute of Metals*, v. 76, Dec. 1949, p. 321-360.

Measurements of undercooling before solidification in castings of various alloys were correlated with grain-sizes. The experiments showed that, except in melts containing boron, the nuclei were not crystals of the intermetallic compounds of the refining metals with Al; theoretical considerations suggested that they were particles of the simple interstitial carbides of these transition metals. 35 ref (E26, Al)

59-E. The Effect of Grain-Size on the Tensile Properties of High-Strength Cast Aluminum Alloys. A. Cibula and R. W. Ruddle. *Journal of the Institute of Metals*, v. 76, Dec. 1949, p. 361-376.

By varying the superheating temperature before casting, test bars having different grain-sizes were produced from metal cast at the same temperature, thus making it possible to distinguish between the effects of grain-size and other factors depending upon casting temperature. In this way, coarse and fine-grained test bars of Al + 4.5% Cu were poured at several temperatures in the range 680-900° C. Some results obtained with Al + 10% Mg are also presented. 12 ref. (E26, Al)

60-E. A Method of Improving the Pressure-Tightness of Lead-Free Gun-Metal Sand Castings. W. H. Glaisher. *Journal of the Institute of Metals*, v. 76, Dec. 1949, p. 377-387.

Effect of adding P, as P-Cu, to degassed lead-free gunmetal (88:10:2 and 88:8:4 Cu-Sn-Zn) before pouring, so as to cause a controlled amount of gas absorption, resulting from reaction of the residual P with the moisture of the sand mold. By the use of P, pressure-tightness of the disc castings was improved, the best castings being equal to those in leaded gunmetal, while their mechanical properties were better. Soundness and quality were, however, inferior. (E26, Cu)

61-E. Pattern Equipment for Production Moulding. S. A. Horton. *Foundry Trade Journal*, v. 88, Jan. 5, 1950, p. 3-10; discussion, Jan. 12, 1950, p. 42-43.

Fundamentals of pattern construction and practical applications with emphasis on special requirements for quality production and for high-accuracy molding. Detailed account of many aspects of core-blowing practice. (E17)

62-E. Can the Manufacture of Malleable Cast Iron Be Improved? S. W. Palmer. *Foundry Trade Journal*, v. 88, Jan. 12, 1950, p. 31-38; Jan. 19, 1950, p. 65-68; discussion, p. 68-69.

Day-to-day problems in the light of research reported in the literature. (E general, CI)

63-E. Foundry Melting Furnaces for Copper and Nickel-Base Alloys. F. C. Evans. *Foundry Trade Journal*, v. 88, Jan. 19, 1950, p. 59-64.

Metallurgical and economic features of various units. Liability for gas absorption, composition control and metal loss, fuels available, and labor and capital costs. 14 ref. (E10, Cu, Ni)

64-E. Wear of Cupola Linings. (In French.) Pierre Nicolas. *Fonderie*, Nov. 1949, p. 1837-1838.

Recommendations in connection with cupola design and refractory compositions. (E10)

65-E. Alloys for Foundry Patterns and Matchplates; Precautions for Avoidance of Cavities. (In French.) Jean Duport and Pierre Rigaut. *Fonderie*, Nov. 1949, p. 1838-1840.

Use and composition of Al alloys for patterns. Diagrams show recommended designs. (E17, T5, Al)

66-E. Magnesium Die Casting in Germany. Part I. Alfred F. Bauer. *Modern Metals*, v. 6, Feb. 1950, p. 17-22.

The first machine designed specifically for die casting magnesium was built in 1925 in Germany. During the next 20 years, the science of die casting magnesium was carried to its highest level by German engineers. Comprehensive analysis taken from the report of Military Planning Div Office of the Quartermaster General, U. S. Army (To be continued.) (E13, Mg)

67-E. Investment Casting Magnesium. William F. Davenport and G. W. Orton. *Iron Age*, v. 165, Feb. 16, 1950, p. 94-96.

Air Force tests on Mg alloys AZ63 and AZ92 normally used only for sand castings show that they can be successfully cast by the lost-wax process with mechanical properties similar to standard sand castings. (E15, Mg)

68-E. How To Use Phenolic Casting Resins for Pattern Coatings. E. J. McAffee. *American Foundryman*, v. 17, Feb. 1950, p. 27-28.

Advantages over other pattern-coating materials. Recommended compounding ingredients. (E17)

69-E. Sheet Metal Forms Simplify Molding and Coremaking. Harry W. Dietert. *American Foundryman*, v. 17, Feb. 1950, p. 36-38. (E19, E21)

70-E. Casting Steel and Iron Rolls. *American Foundryman*, v. 17, Feb. 1950, p. 42-45.

Picture story at Mackintosh-Hemphill Co., Pittsburgh. (E11, T5, ST, CI)

71-E. Closed Top System in Cupola Stack Emission Control. J. F. Drake and T. G. Kennard. *American Foundryman*, v. 17, Feb. 1950, p. 55-57. (E10, CI)

72-E. Factors Influencing Core Sand Selection. Joseph P. Avylla. *American Foundryman*, v. 17, Feb. 1950, p. 58. (E18)

73-E. Production of High Alloy Steel Castings. W. H. Worrilow. *Steel*, v. 126, Feb. 13, 1950, p. 89-90, 92, 94, 96; Feb. 20, 1950, p. 91-94, 102, 105.

Castings containing 8% or more of various alloying elements. Includes inspection procedures, heat treatment, research program of the Alloy Casting Institute, etc. (E11, CI)

74-E. Permanent Mold, Die and Investment Casting of Magnesium. *Magazine of Magnesium*, Feb. 1950, p. 8-11. (E12, E13, E15, Mg)

75-E. Refractory User Calls Uniformity Greatest Need. *Brick & Clay Record*, v. 116, Feb. 1950, p. 69, 71.

Need for uniformity from shipment to shipment. Super-duty firebrick preferred over silica or mullite for back walls of melting furnaces for steel castings. (E10, CI)

76-E. Gravity Die Castings in Free Cutting Brass. *Machinery* (London), v. 76, Jan. 26, 1950, p. 133-134.

The comparatively short life of existing die materials under the severe conditions imposed by the casting of brass has prevented successful commercial production of brass die castings. On the basis of experience of a British firm, the process is shown to be not only practicable but can be carried out on an extensive scale. It does not appear that the residual stresses in such castings are excessive (E13, Cu)

77-E. Insert Dies for Die-Castings. *Machinery* (London), v. 76, Jan. 26, 1950, p. 134-136.

Use of small inserts mounted in standard die sets to reduce die costs. (E13)

78-E. Refractories for the Foundry. A. Gunn. *Foundry Trade Journal*, v. 88, Jan. 26, 1950, p. 87-92; discussion, p. 92-94.

Problems related to cupola refractories. Types of refractories available, causes of failure in the various cupola zones, slag reactions, compositions, and functions. (E10)

79-E. Cast Permanent Magnets. A. Braybrook and D. Hadfield. *Foundry Trade Journal*, v. 88, Jan. 26, 1950, p. 95-101.

Historical development of permanent-magnet alloys showing that modern compositions necessitate production as castings, because the metals are unmachinable except by grinding. Molding, melting, pouring, and after-treatment methods for mass production. (E general, SG-n)

80-E. Foundry Practice in Sweden. R. Laroux Handley. *Foundry Trade Journal*, v. 88, Jan. 26, 1950, p. 102-105. (E general)

81-E. Gating Systems and the Production of Some General-Engineering Castings. W. Collinge. *Foundry Trade Journal*, v. 88, Feb. 2, 1950, p. 111-115; discussion, p. 115-118, 122.

Methods developed for producing a range of ferrous castings for flameproof electric motors and an "Index" automatic machine. (E22, CI)

82-E. (Book) **Atlas of Defects in Castings.** Ed. 2. 75 pages. Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester 3, England. Members, 7s., 6d.; nonmembers, 21s.

The earlier loose-leaf form, showing a few well-chosen examples of defects, is replaced by a bound volume of greater variety and number of illustrated "defects". Contains over 90 photographs, illustrating some 50 or so defects, each followed by title or classification; concise description; cause; and suggested remedy. (E general)

F

PRIMARY MECHANICAL WORKING

14-F. Selection of Forging as a Method of Fabrication. J. J. Sloan and L. R. Denny. *Iron Age*, v. 165, Jan. 19, 1950, p. 70-75.

Weighs forging against other fabrication methods with respect to function, design, and cost. Comparative cost analysis of typical aircraft parts. Materials considered are Al and Mg alloys, and a variety of steels. (F22, T24, Al, Mg, ST)

15-F. Low Cost Manufacture of Large Diameter Pipe. Paul J. Abel. *Iron Age*, v. 165, Jan. 26, 1950, p. 77-82.

Freight rates, duties, insurance, and other cost factors favor fabricating plate at pipe mills near the point of consumption rather than purchasing completed pipe. Production methods, equipment, and sequences, as well as production and cost figures. (F26, ST)

16-F. Graphical Analysis of Power Consumption in Hot Rolling. J. H. Mort. *Sheet Metal Industries*, v. 27, Jan. 1950, p. 5-18, 20.

Based on operating data and on theoretical calculations. Power curves based on displacement are more reliable as guides to energy expenditure per unit of weight than those founded on elongation. (F23)

17-F. Western Pipe Goes East. Gordon B. Ashmead. *Western Machinery*

and Steel World, v. 41, Jan. 1950, p. 66-69, 92-93.

Miscellaneous pipe manufacturing equipment of Basalt Rock Co., which produces steel pipe from plate furnished by Kaiser Steel Corp. Included are flame cutting, forming, welding, coating, etc. (F26, ST)

18-F. Forging for Fabrication. J. J. Sloan and L. R. Denny. *Western Machinery and Steel World*, v. 41, Jan. 1950, p. 74-77, 98.

Forging of steels and Mg and Al alloys by North American Aviation. (F22, ST, Al, Mg)

19-F. Seamless Tubes: A Pictorial Story. *Western Machinery and Steel World*, v. 41, Jan. 1950, p. 78-79.

Manufacture of Al tubes by extrusion. (F26, F24, Al)

20-F. Ferrous and Nonferrous Metals Handled by Moderate Production Shear Line. *Steel*, v. 126, Jan. 30, 1950, p. 54.

Line developed for use in steel, brass, or copper mills, warehouses and fabricating plants. It consists of a coil stop, payoff reel, roller leveller, looping table, upcut shear, gage table and automatic gage unit, oiling unit, pinch rolls, and sheet piler. (F29)

21-F. Effective Designing With Aluminum Extrusions. H. V. Menking. *Modern Metals*, v. 5, Jan. 1950, p. 16-20.

Wide range of design possibilities inherent in extrusion of Al, as well as basic engineering principles of this process. (F24, Al)

22-F. Ingot Heat Conservation; Time Studies From Casting to Rolling. A. V. Brancker, J. Stringer, and L. H. W. Savage. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 67-84.

Observations were made at three plants of the progress of hot ingots from the casting bay to the cogging mill, in an attempt to find the causes of delays and their effects on soaking-pit operations. Worthwhile savings are possible, especially in reduction of time during which ingots can lose heat between teeming and charging to the soaking pit. (F21, ST)

23-F. A Summary of Accomplishments To Improve Surface Quality of Steel. S. C. Faddis. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 340-356.

Various causes of surface defects which include raw materials, refining processes, blooming mill practices, scarfing, and rolling. Includes graphs and illustrations. (F general, D general, ST)

24-F. Ring Forging Speeded on First Western Roller at C.B.S. *Western Metals*, v. 8, Jan. 1950, p. 28.

Equipment and procedure for producing forged continuous rings up to 7 ft. in diam. without welding. A roller method is used. (F23, F22)

25-F. Resistance Heating for Hot Forming 75S-T6 Aluminum. A. L. Schoellerman. *Product Engineering*, v. 21, Feb. 1950, p. 85-87.

In a test program, Northrop engineers attempted to determine which of two resistance-heating methods would give most satisfactory production. In evaluating the two types, effect of time and temperature on physical properties, heating time vs. cross-sectional area, and methods of temperature control were investigated. (F21, Al)

26-F. Effect of Carbon in Titanium Metal Ingots. E. A. Gee, J. B. Sutton, and W. J. Barth. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 243-249.

Titanium ingots containing 0-1.5% C were forged and rolled. Such ingots can be forged readily at 1700° F. All metal was rolled at 1450° F. without extensive surface or edge checking, excepting the highest carbon ingot. Ultimate tensile strength, yield strength, elongation, bend ductility, and hardness. (F22, F23, Q general, Ti)

27-F. Electric Equipment for Rolling Cold Strip at 70 MPH. William E. Miller. *Iron and Steel Engineer*, v. 27, Jan. 1950, p. 119-126; discussion, p. 126-128.

Equipment in service at Jones and Laughlin's tinplate mill. 10 ref. (F23, ST)

28-F. The Rolling of Stainless Steel. John A. De Fries. *Iron and Steel Engineer*, v. 27, Jan. 1950, p. 129-132; discussion, p. 132.

Recommended equipment and procedures for various grades. (F23, SS)

29-F. Better Welds Expected From New Electric Tube Welding Process. John B. Borgadt. *Steel*, v. 126, Feb. 13, 1950, p. 99-100, 102, 104.

Improved welds, freedom from inclusions, increased wall thickness, and applicability to a greater variety of steels are among the advantages cited for an air-operated intermittent machine which employs surface-contact electrodes to convey current across seam cleft of the tube. A combination of mechanical and electrical devices produces a good tube weld with fine grain structure almost equal to parent metal. (F26)

30-F. Symposium on Tungsten Carbide Dies. *Wire and Wire Products*, v. 25, Feb. 1950, p. 133-135, 138-143, 166-171.

Use of tungsten carbide dies in wiredrawing. (F28)

31-F. Symposium on the Use and Care of Diamond Wire Drawing Dies. *Wire and Wire Products*, v. 25, Feb. 1950, p. 145-147, 156-157, 159-164. (F28)

32-F. A Review of the Forging Industry. Harry L. Showalter, Jr. *Steel Processing*, v. 36, Jan. 1950, p. 26-30, 44.

Reviews 1949 developments. (F22, ST)

33-F. Production Line Heating for Forging. Frederick O. Hess. *Steel Processing*, v. 36, Jan. 1950, p. 37-42.

Use of radiant gas heating. Differences in surface and internal structures of steel after high-speed and conventional heating. (F21, ST)

34-F. Scovill's New Mill for Rolling Brass Strip. Harold J. Roast. *Metal Progress*, v. 57, Feb. 1950, p. 197-200.

New mill, which is completely automatic from flat metal casting to packaging. (F23, Cu)

35-F. Fast Heating of Large Diameter Pipe. Richard M. Hortvet. *Iron Age*, v. 165, Feb. 16, 1950, p. 97-99.

Use of the high-temperature-head principle to heat pipe and tubing rapidly. The unit solves the problem of inadequate length of regular furnaces used in manufacture of steel pipe 40 ft. long. (F26, ST)

36-F. Forging Stainless Steel. Lester F. Spencer. *Iron Age*, v. 165, Feb. 16, 1950, p. 100-104.

Methods and equipment used in forging stainless stock. (F22, SS)

37-F. Aluminium Rolling in Chile. *Light Metals*, v. 13, Feb. 1950, p. 78-79.

Proposed new plant. (F23, Al)

38-F. A Line on Pipes. *Ethyl News*, Feb. 1950, p. 7-9.

Manufacture of large pipes for pipelines. Includes cleaning and finishing, forming, and welding. (F26)

39-F. Precision Sheet-Metal Parts; Manufacture of Assemblies for American Gas-Turbine Engines. W. C. Heath. *Aircraft Production*, v. 12, Feb. 1950, p. 58-62.

Miscellaneous forming, machining, and welding equipment and procedures. Materials used are Inconel and stainless steels. (T24, Ni, SS)

40-F. Mill Tackle; Precision Design for Improved Quality of Product. M. S. Doshi. *Iron and Steel*, v. 23, Feb. 1950, p. 39-45.

The different components used in rolling-mill practice, their design, and functions. How the quality and quantity of the rolled product can be considerably improved, and how manual work can be eliminated, especially in the rolling of heavy rails, by providing the right kind of equipment. (F23)

41-F. French Steel Sheets; Reconstruction of Mill Plant at the Forges de Leval-Aulnoye. *Iron and Steel*, v. 23, Feb. 1950, p. 55-57. (F23, ST)

42-F. Production Economy in the Rolling of Aluminium. W. J. Thomas and W. A. Fowler. *Engineering*, v. 169, Jan. 6, 1950, p. 26-27; Jan. 13, 1950, p. 36-37; Jan. 20, 1950, p. 64-65. (Condensed.)

A series of new problems resulting from the installation of continuous or semi-continuous mills. Solution of these problems would result in improved economy and quality of product. (F23, Al)

43-F. (Book) **Manual of Open Die Forgings.** 181 pages. Open Die Forging Industry, 366 Madison Ave., New York 17, N. Y. $3.00.

A careful statement of modern trade practices in the manufacture, heat treatment, testing and inspection of heavy forgings or press work, solid or hollow, which (if read and comprehended) should do much to prevent expensive disagreements between vendors and meticulous purchasers.—E.E.T. (F22)

G

SECONDARY MECHANICAL WORKING

39-G. Measuring Machinability on a Constant Pressure Lathe. *Iron Age*, v. 165, Jan. 19, 1950, p. 68-69.

Previously abstracted from *Transactions of the American Society of Mechanical Engineers*. See item 20B-101, 1949. (G17)

40-G. Welding Cuts Costs in Deep Drawing Front Fenders. A. B. Mooers. *Iron Age*, v. 165, Jan. 26, 1950, p. 73-76.

Fender fabrication technique, which utilizes a preformed blank of sheet steel bent and welded to near final draw size. Heating after the initial draw along with high scrap losses of the old method have been eliminated. (G4, K general, CN)

41-G. Non-Metallic Dies For Aircraft Fabrication. John Delmonte. *Aero Digest*, v. 60, Jan. 1950, p. 52-53, 97.

Properties and applications. (G1, T24)

42-G. Cookie Cutters. Ed Carpenter. *Western Machinery and Steel World*, v. 41, Jan. 1950, p. 80-81.

Use of steel cutting rules for dinking dies in manufacture of stainless steel or duralumin parts from sheet, in a manner similar to cutting cookies out of dough. (G2, Al, SS)

43-G. Three New Steels Offer Higher Machinability Rates. *Materials & Methods*, v. 31, Jan. 1950, p. 51-52.

The "E" group bessemers of Jones & Laughlin; "Ledloy" (AISI B1113 plus Pb, and produced in the open-hearth) by Ryerson; and La-Led (La Salle Steel Co.). (G17, SG-k)

44-G. Vickers-Supermarine Attacker. Part I. Naval Interceptor-Fighter in Production; Basic Manufacturing Proc-

esses; Fuselage Construction. S. C. Poulsen. *Aircraft Production*, v. 12, Jan. 1950, p. 11-18.

Equipment and methods include simplified press-tools, routing, folding, hole-punching, and rubber-die press-forming technique. Fuselage structure. (G1, T24)

45-G. For Better Machinability — E Steel. F. T. Kent. *Iron Age*, v. 165, Feb. 2, 1950, p. 79-81, 96.

New free-machining steel said to give up to 25% faster metal removal and 200% increase in tool life, plus a good surface. (G17, CN, SG-k)

46-G. Better Machinability With MX Steel. A. W. MacLaren and L. W. Oswald. *Iron Age*, v. 165, Feb. 2, 1950, p. 86-88.

New bessemer steel within the composition limits of AISI B-1113 has 45% better machinability than conventional B-1113. The principal factors responsible for improved machinability are: carbon level, silicon level, manganese level, nature of sulfide inclusions, and control checking of the product. (G17, CN, SG-k)

47-G. Savings in Flame-Cutting. J. T. Lewis, Jr. *Welding Engineer*, v. 35, Feb. 1950, p. 28-32.

Equipment selection, shop layout, handling methods, gas-supply considerations, and supervision. (G22)

48-G. Arc Cutting Scraps Turbogenerator. *Welding Engineer*, v. 35, Feb. 1950, p. 42.

Cutting up of 3000-kw. cast-iron unit (G22, CI)

49-G. Bolt Heading and Marking Hammers. *Iron Age*, v. 165, Feb. 9, 1950, p. 90.

Combination bolt-heading and marking hammers of solid carbide for automatic bolt-heading machines make possible the elimination of separate marking operations in the manufacture of bolts, nuts, rivets, and similar products. (G10, CN)

50-G. Hot Spot Machining Found To Have No Ill Effects on Finished Part Metallurgy. L. T. Friedman. *Iron Age*, v. 165, Feb. 9, 1950, p. 71-76.

Microhardness surveys, microstructure examinations, surface analyses, and Faxfilm replicas show that localized heating for machining has no detrimental effects on hardness, surface condition, and microstructure of finished steel parts. Studies were made on bars machined at room temperatures, 600-700°, 1000°, and 1450° F. (G17, ST)

51-G. An Investigation of the Weavability of Wire With Observations on the Defects of Wire and Wire Cloth. Walston Chubb, Jr. *Wire and Wire Products*, v. 25, Feb. 1950, p. 125-129, 174-177.

Objectives of investigation, history and background material, literature review. Investigations were limited to plain-carbon steel. Production of the wire, its testing, weaving of wire cloth, weavability, and mechanical properties related to weavability. (G general, CN)

52-G. Determining Torque in Tapping. A. J. Carruthers. *Machinery* (American), v. 56, Feb. 1950, p. 149-152.

Describes method by means of which tapping torque can be sensitively measured and recorded. The torque-meter measures the torque produced as a result of the combined effects of tap design, speed, lubricants, etc., any individual factor being isolated by changing it while other conditions remain constant. (G17)

53-G. Spinning Permits Design Flexibility. *Product Engineering*, v. 21, Feb. 1950, p. 100.

Disk-shaped device used in air-conditioning equipment, and produced by spinning of various metals. (G13)

54-G. New Deep Drawing Technique. Dan Reebel. *Steel*, v. 126, Feb. 13, 1950, p. 82-83, 108.

Drawing of a 38½-in. blank of 0.105-in. thick steel into a half-tank section, 14¾ in. in diam. and 24 in. deep by method which eliminates four to six operations in addition to the washing, degreasing, and annealing usually required. (G4, ST)

55-G. The Evolution of Deep Drawing Lubricants. G. A. Cairns. *Finish*, v. 7, Feb. 1950, p. 27-29, 68, 70.

Brief history of early development work. Compounds now in use; advantages and disadvantages of each. (G21)

56-G. The Stamping Industry in 1949. John C. McComb. *Steel Processing*, v. 36, Jan. 1950, p. 22-25.

New types of equipment and procedures. (G1)

57-G. New Dinking Dies Lower Blanking Costs. Thomas A. Dickinson. *Steel Processing*, v. 36, Jan. 1950, p. 31-33.

Development of inexpensive "dinking" dies—with which both ferrous and nonferrous sheets can be precision-blanked on a limited-production basis with efficient press equipment. (G2)

58-G. Improved Drawing and Cleaning With Dry Film Drawing Compound. B. L. Smalley and L. R. Kerns. *Enamelist*, v. 26, Winter 1949-50, p. 8-11.

Advantages of use of "Dry-Film" during drawing of steel which is to be enameled. (G21)

59-G. Metal Drawing Demands Correct Lubrication. E. L. H. Bastian. *Iron Age*, v. 165, Feb. 6, 1950, p. 83-89.

Specific lubricants for press drawing Al, Mg, Cu, brass, and carbon and stainless steels; advantages and limitations of each for individual applications. (G21, Al, Mg, Cu, CN, SS)

60-G. A Dimensional Analysis of Metal Cutting. D. C. Drucker and H. Ekstein. *Journal of Applied Physics*, v. 21, Feb. 1950, p. 104-107.

Present theories and some additional significant variables. The analysis provides a basis for the interpretation of known experimental results, and should serve as a guide for future experimental and theoretical investigations. (G17)

61-G. Bandfiling Aluminum. H. J. Chamberland. *Modern Metals*, v. 6, Feb. 1950, p. 29-30.

Equipment, operation, and potentialities of process. (G17, Al)

62-G. Inexpensive Process for Embossing Aluminum Foil. *Modern Metals*, v. 6, Feb. 1950, p. 34-35.

Oldofredi process in which wire-mesh dies are used. (G3, Al)

63-G. Bending Light-Alloy Tubes. *Light Metals*, v. 13, Feb. 1950, p. 94-97. Translated and condensed from paper by Oskar Gönner, *Eisen- und Metall Verarbeitung*, Apr. 1949.

Workshop methods. Uses and limitations of standard bending devices in relationship to tubes of various diameters, wall thicknesses and compositions. (G6, Al, Mg)

64-G. Sectional Dies Cut Costs. J. R. Paquin. *American Machinist*, v. 94, Feb. 20, 1950, p. 121-123.

Splitting the die lowers manufacturing cost of press tools and reduces maintenance expense. (G1)

65-G. The Case for Nonferrous Hot Die Pressings. F. S. Hyde. *Materials & Methods*, v. 31, Feb. 1950, p. 65-67.

Compares relative merits of die pressings, castings, screw-machine parts, and built-up assemblies. (G1, EG-a)

66-G. Steel Warehouse Flame Shape Cutting. W. O. Springer. *Welding Journal*, v. 29, Feb. 1950, p. 97-101; discussion, p. 101-102.

Electronic-tracer flame shape cutting and its operation and applications. (G22)

67-G. Flame Cutting. James T. Lewis, Jr. *Welding Journal*, v. 29, Feb. 1950, p. 116-120.

Installation and maintenance of flame-cutting installations and procedures which contribute to economical operation. (G22)

68-G. Surface Finish Obtained by Grinding. E. N. Maslov. *Industrial Diamond Review*, new ser., v. 10, Jan. 1950, p. 9-10. Translated from *Stanki i Instrument* (Machine Tools and Equipment), v. 19, Jan. 1948, p. 23-24.

Presents results of tests made to determine the influence of grinding conditions and peripheral speeds on surface finish of "9x" Cr steel. (G18, AY)

69-G. Theory of the Metal-Cutting Process. (In Russian.) A. M. Rozenberg and A. N. Eremin. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, Oct. 1949, p. 5-7.

Relations between phenomena occurring during cutting process. It was found that the basis of all changes in cutting phenomena is the change of temperature at the front face of the cutting edge. (G17)

70-G. Investigation of Maintenance of Tolerances of Smoothness and of Cold Hardening During Drilling, Countersinking, and Reaming of Holes. (In Russian.) M. O. Yakobson. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, Oct. 1949, p. 11-13.

Problems involved in obtaining high accuracy of dimensions and correct geometric shape of machine parts, together with obtaining surfaces of minimum roughness were investigated for steel and cast iron. (G17, ST, CI)

71-G. (Book) Production Processes; Their Influence on Design, Vol. I. Roger W. Bolz. 568 pages. Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio. $10.00.

Based on a lengthy series of articles appearing in *Machine Design* since 1945. Prepared to assist designers in analyzing the influences of various shop procedures on design. Methods for removing metal, for forming metal, for working and forging metal, and for depositing metal. Includes 652 illustrations and an index. (G general, F general)

H

POWDER METALLURGY

6-H. Infiltration of Powder Metal Compacts With Liquid Metal. Paul Schwarzkopf. *Metal Progress* v 57, Jan. 1950, p. 64-68.

High-melting metal is first pressed to form a porous compact, and then the lower-melting metal is "infiltrated" as liquid into the pores of this skeleton. Products made by infiltration, with particular emphasis on the structure and properties of Fe-Cu mixtures. (H16, Fe, Cu)

7-H. Infiltrated Alloys. F. V. Lenel. *Metal Progress*, v. 57, Jan. 1950, p. 106, 108, 110. Translated and condensed from "The Preparation and Properties of Infiltrated Alloys", R. Kieffer and F. Benesovsky, *Berg- und Huttenmannische Monatshefte*, v. 94, 1949, p. 284.

Conditions necessary or favorable for preparation of alloys by infiltration; groups of such alloys which have become commercially important during the last 15 yrs. (H16)

8-H. Cemented Carbides Without Metallic Binders. F. V. Lenel. *Metal*

Progress, v. 57, Jan. 1950, p. 110, 120, 122.

Condensed and previously abstracted from "Sintering Carbides by Means of Fugitive Binders", Laurence S. Foster, *U. S. Atomic Energy Commission*, AECD-2464, Jan. 28, 1949. (H15)

9-H. Powder Metallurgy; Review of Progress During 1949. R. A. Hetzig. *Metallurgia*, v. 41, Dec. 1949, p. 88-90.

Includes uses of metal powders in which they do not undergo the process of pressing and sintering. Applications are emphasized. 50 ref. (H general)

10-H. A Phenomenological Theory of Sintering. J. K. Mackenzie and R. Shuttleworth. *Proceedings of the Physical Society*, v. 62, sec. B, Dec. 1, 1949, p. 833-852.

Fundamental differences between the theory as applied to glasses and that for metals. Sphering of the pores; driving force and resistance to deformation; kinetics of sintering; theory of sintering; influence of gas; suggested experiments. 29 ref. (H15)

11-H. The Extrusion of Powdered Magnesium Alloys. R. S. Busk and T. E. Leontis. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 297-306.

Direct extrusion of Mg-alloy powder was used to produce four new Mg-alloy types by controlled solid-state diffusion. The importance of the use of atomized powder, a new mechanism termed "interference hardening", a method for combating stress corrosion, and a method for increasing the hot-short speed of extrusions. 19 ref. (H14, Mg)

12-H. Behavior of Pores During the Sintering of Copper Compacts. F. N. Rhines, C. E. Birchenall, and L. A. Hughes. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 378-388.

Experimental studies of density and size distribution and shape of pores carried out on copper compacts sintered in vacuum, hydrogen, and argon for 1, 10, 100, and 1000 hr. at 800, 900, and 1000° C. A theoretical model was formulated, in terms of the vacancy mechanism of body diffusion, to account for changes in pore distribution and densification. 16 ref. (H15, Cu)

13-H. Powder Metallurgy Progress. R. A. Hetzig. *Chemical Age*, v. 62, Jan. 14, 1950, p. 79-82.

Reviews 1949 developments. 39 ref. (H general)

14-H. The Elastic Constants of a Solid Containing Spherical Holes. J. K. Mackenzie. *Proceedings of the Physical Society*, v. 63, sec. B, Jan. 1, 1950, p. 2-11.

Bulk modulus is determined by applying hydrostatic pressure, and shear modulus by applying a simple homogeneous shear stress to a large sphere. By using the hydrodynamic analogue of the elastic problem, the theory is briefly applied to the sintering process and used to discuss the effective viscosity of a liquid containing small air bubbles. (H15)

15-H. Production and Heat Treatment of Copper Powder. H. J. V. Tyrrell. *Engineering*, v. 169. Jan. 13, 1950, p. 51-53. A condensation.

Previously abstracted from *Journal of the Institute of Metals*. See item 5C-23, 1949. (H10, H11, Cu)

16-H. Recent Developments in Powder Metallurgy. Supplement to "Powder Metallurgy—Its Physics and Production". Part III. Paul Schwarzkopf. *Powder Metallurgy Bulletin*, v. 5, Jan.-Mar. 1950, p. 4-14.

Theoretical concepts. 61 ref. (H general)

17-H. Use of the Transverse Rupture Test To Evaluate a New Stainless Steel Powder. George Stern. *Powder Metallurgy Bulletin*, v. 5, Jan.-Mar. 1950, p. 15-16.

Use of testing method recently described by Scanlan and Seelig. As a result, two grades of more readily compactible stainless steel powders were developed: a straight 14% Cr grade; and a grade containing approximately 16.5% Cr and 8% Ni. Green strengths of compacts are tabulated. (H14, SS)

18-H. A Horizontal High Vacuum Electrical Resistance Furnace. W. E. Kuhn and O. W. Ellis. *Canadian Journal of Research*, v. 28, sec. F, Jan. 1950, p. 1-20.

Furnace used in production of sintered compacts of Ti and Ti alloys. The main contributory factor to high cost is degassing of refractories. The problem is to reduce the amount of refractories to be degassed to a minimum. Two methods of doing this are available—one employs a heat resistant alloy or metal within an insulated heated chamber; the other a refractory heater surrounded by an insulated radiation shield. The furnace was built according to the latter design. 11 ref. (H15, Ti)

J HEAT TREATMENT

29-J. Continuous Induction Hardening of Cold Finished Steel Bars. J. J. Day, Jr. *Metal Progress*, v. 57, Jan. 1950, p. 69-72.

Full cross-sectional hardening of bar stock—that is, hardening as deeply as the hardenability of the steel will permit. Soft centers can be produced by suitable control of the power input and rate of travel of the bar. Continuous induction hardening compared with conventional heating and water quenching. (J2, CN)

30-J. A Modern Flash-Annealing Furnace: Details of a New Plant Design. *Sheet Metal Industries*, v. 27, Jan. 1950, p. 19-20.

British installation. (J23)

31-J. Induction-Hardened Gears. Part I. Equipment and Methods. H. F. Kincaid. **Part II. Engineering Tests and Service Performance.** H. B. Knowlton. *SAE Quarterly Transactions*, v. 4, Jan. 1950, p. 116-131; discussion, p. 131-134.

Previously abstracted from condensed version in *SAE Journal*. See item 22-J, 1950. (J2, T7)

32-J. High-Frequency Heat-Treatment of Gears—Equipment and Processes. John A. Redmond. *SAE Quarterly Transactions*, v. 4, Jan. 1950, p. 135-146; discussion, p. 146.

Previously abstracted from condensed version in *SAE Journal*. See item 22-J, 1950. (J2, T7)

33-J. Dual-Purpose Salt Bath Cuts Steel Processing Costs. C. M. Campbell. *Materials & Methods*, v. 31, Jan. 1950, p. 62-63.

Descaling and tempering steps are combined to prepare automotive forgings for finishing without sacrifice of quality. (J2, CN)

34-J. Problems and Remedies in Heat Treating Stainless Steels. *Materials & Methods*, v. 31, Jan. 1940, p. 81.

A tabular presentation. (J general, SS)

35-J. Hardening, Quenching, and Tempering in the Helical Spring Production Line. P. E. Eckberg. *Industrial Gas*, v. 28, Jan. 1950, p. 3-5.

Equipment. (J general, CN, AY)

36-J. Heat Treating Non-Ferrous Metals and Alloys. J. W. Meier. *Canadian Metals*, v. 13, Jan. 1950, p. 12-16.

Methods are outlined in relation to the metallurgical properties required. 16 ref. (J general)

37-J. Discussion on "The Design and Operation of Annealing Plant for Mild-Steel Sheets and Coils". *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 87-90.

Refers to paper by R. D. Pollard in May 1949 issue. See item 18B-91, 1949. (J23, CN)

38-J. Salt Baths for Annealing and Descaling. Ernest Hague. *Metallurgia*, v. 41, Dec. 1949, p. 63-67.

Advantages associated with salt-bath heating. (J2)

39-J. Mass Production of "Raydex" Hardened Plow Shares. *Industrial Heating*, v. 17, Jan. 1950, p. 26, 28, 30, 32-34, 36, 38, 182, 184, 186.

Automatic continuous heat treatment equipment for hardening unique three-piece plowshares made from SAE 1095 bar steel. (J26, CN)

40-J. Scale Reduction in Controlled Atmosphere Cycle Annealing. C. A. Payntor. *Industrial Heating*, v. 17, Jan. 1950, p. 42-44, 46, 48-49, 169-170.

Previously abstracted from *Iron Age*. See item 18B-235, 1949. (J23, ST)

41-J. Effect of Annealing in a Magnetic Field Upon Iron-Cobalt and Iron-Cobalt-Nickel Alloys Prepared by Powder Metallurgy. Joseph F. Libsch, Eberhard Both, George W. Beckman, Donald Warren, and Robert J. Franklin. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 287-296.

The 50% Fe-Co alloy exhibits optimum magnetic properties and an essentially rectangular hysteresis loop when subjected to the best magnetic annealing cycle developed. Small amounts of Ni appear to be detrimental in the alloys studied. 27 ref. (J23, P16, SG-n)

42-J. Heat Treating in the Field. James Kneiper. *Industry & Welding*, v. 23, Feb. 1950, p. 16-18, 42, 44, 46.

Procedures for welding and stress-relief heat treatment of the welds in large refinery equipment and the like. Elements for resistance preheating and stress relief. Use of the induction method on pipes up to 36 in. diam. (J1, K general)

43-J. Implications in High Speed Heating for the Steel Industry. Frederic O. Hess. *Iron and Steel Engineer*, v. 27, Jan. 1950, p. 63-73; discussion, p. 73.

High-speed heating techniques utilizing gas as fuel; heating rates of 1-5 min. per in. of thickness are in contrast to conventional practice of ½-1 hr. per in. of thickness. Procedures and equipment. Comparative structural characteristics of steels annealed by high-speed and conventional methods. (J23, ST)

44-J. Heating by High-Frequency Fields. I. Induction Heating. E. C. Witsenburg. *Philips Technical Review*, v. 11, Dec. 1949, p. 165-175.

Fundamental principles, practical equipment, and procedures; and applications in metallurgy—surface hardening, annealing, brazing and soldering, and melting. A formula is derived for determining the efficiency of the work coil through which the current passes that induces the heating current in the workpieces. (J2)

45-J. Heat Treating Trends and Developments for 1949. Howard E. Boyer *Steel Processing*, v. 36, Jan. 1950, p. 15-21, 44-45.

New developments in equipment. (J general)

46-J. Wild-Barfield Forced Air Cir-

culation Furnaces for Heat Treating Light Alloys. *Machinery* (London), v. 76, Jan. 12, 1950, p. 55-56.
(J general, Al)

47-J. Some Effects of Quenching and Tempering on Residual Stresses in Steel. A. L. Boegehold. *Metal Progress*, v. 57, Feb. 1950, p. 183-188.
Experimental data for cylindrical specimens of a variety of carbon, alloy, and toolsteels. It is concluded that unfavorable residual stress may be present after tempering and should be determined experimentally to be sure that the steel is being used to best advantage. (J26, J29, Q25, ST)

48-J. Some Experiments on Beryllium Steels. Michael G. Corson. *Metal Progress*, v. 57, Feb. 1950, p. 211-212.
Work was done on five series of steels, each containing the same nine C-Be combinations. Hopes concerning resistance to softening during tempering did not materialize. Possibility of discovering unusually good properties seems remote in the Fe-Be-C system. (J29, AY)

49-J. Protective Atmospheres in Industry. Part XIII. A. G. Hotchkiss and H. M. Webber. *General Electric Review*, v. 53, Feb. 1950, p. 43-51.
Methods for heat treating, metals hardening, electric-furnace brazing, powder metallurgy, and gas carburizing in which protective atmospheres are used. (J2)

50-J. Formability of Strong Aluminum Alloys Improved by Re-Solution Treatment. Paul W. Boone. *Materials & Methods*, v. 31, Feb. 1950, p. 60-62.
Method useful when 14S, 24S, and R301 are to be formed which does not lower strength properties when alloys are fully aged after forming. The process consists of heating the alloy at slightly elevated temperatures for a short period and then air cooling to room temperature.
(J27, Q23, Al)

K

JOINING

72-K. Details of Some Recent Developments in the Joining of Sheet Material by Spring-Joint Methods. W. Cookson. (Continued.) *Sheet Metal Industries*, v. 27, Jan. 1950, p. 23-25, 34.
A general-purpose clip joint, a corner joint, air-duct fittings, and a general-purpose sheet-roofing joint. (To be continued.) (K13)

73-K. Survey of Modern Theory on Welding and Weldability. (Continued.) D. Séférian. *Sheet Metal Industries*, v. 27, Jan. 1950, p. 53-64.
All types of weld tests, both macro and micromechanical. Test setups and tables giving typical results.
(K9)

74-K. Thick Aluminum and Stainless Steel Joined by New Inert-Gas Shielded Metal-Arc Welding. H. R. Clauser. *Materials & Methods*, v. 31, Jan. 1950, p. 53-56.
Development of new equipment which employs consumable metal electrodes further improves this welding process, and greatly extends its use in joining difficult-to-weld materials. (K1, Al, SS)

75-K. Trends in Fabrication by Welding. S. V. Williams. *Canadian Metals*, v. 13, Jan. 1950, p. 39-43. Reprinted from *Welding Journal*.
(K general)

76-K. New Techniques Feature Capitol Re-Roofing. *Sheet Metal Worker*, v. 41, Jan. 1950, p. 140-142.
Self-propelled electric batten seamer used for the first time in constructing an all-copper roof for the U. S. Capitol. It operates on the same principle as a conventional lock-forming, or cold roll forming machine. (K13, Cu)

77-K. Heliarc Welding in the Automotive Industry. R. H. Bennewitz and F. J. Pilia. *Western Machinery and Steel World*, v. 41, Jan. 1950, p. 86-89, 102.
(K1, T21, ST)

78-K. Electrolytic Corrosion Eliminated by Nelson Rivweld System. *Modern Metals*, v. 5, Jan. 1950, p. 22.
New-type fastener which prevents aluminum-to-steel contact at the fastening point. This device consists of a flux-filled, cadmium-plated steel female stud with a cross-shaped aluminum insert. (K13, Al, ST)

79-K. Use of High Strength Structural Bolts in Steel Railway Bridges. A. G. Rankin, Frank Baron, J. E. Bernhardt, W. E. Dowling, R. B. Hennessy, N. E. Nueni, C. T. G. Looney, and H. C. Tammen. *American Railway Engineering Association, Bulletin*, v. 51, Jan. 1950, p. 506-540.
Field-test installations of high-strength structural bolts show superiority of high-strength bolts over rivets. (K13, T26, ST)

80-K. Improved Techniques for Flash Welding Aluminum. Charles Bruno. *Reynolds Metals Technical Advisor*, No. 12, 1950, p. 1-2.
(K3, Al)

81-K. Kalabond RM-2: A New Type Rubber-to-Metal Adhesive. E. V. Osberg and G. S. Schaffel. *Rubber Age*, v. 66, Jan. 1950, p. 416-417.
Adhesive is believed to provide a direct chemical bridge between rubber and metal. It is based on a polymer containing reactive chemical groups. These groups react with miscellaneous surfaces to form a strong chemical bond. (K11)

82-K. Non-Welds: The Investigation and Elimination of a Fault in the Resistance Welding of Aluminium Alloy. G. W. Weeks. *Aircraft Production*, v. 12, Jan. 1950, p. 7-10.
The difficulty was shown to be associated with electrode impact-speed and was overcome by proper control. (K3, Al)

83-K. Oxy-Acetylene Pressure Welding. N. L. G. Lingwood and R. E. Dore. *Machinery* (London), v. 76, Jan. 6, 1950, p. 9.
Process as applied to joining symmetrical parts, such as steel tube and bar. (K2, ST)

84-K. Welded Heat Accumulator for the Pimlico District Heating Scheme. *Welding*, v. 18, Jan. 1950, p. 2-9.
Structural details. Accumulator is 126 ft. high and designed to hold half a million gallons of water at 200° F. (K general, CN)

85-K. Land-Rover Production: The Welding Organization and Technique Developed by the Rover Co., Ltd. *Welding*, v. 18, Jan. 1950, p. 10-16.
Production of multi-purpose industrial and agricultural vehicle resembling a "jeep". It has an all-welded chassis and a spot welded aluminum alloy body.
(K general, T21, CN, Al)

86-K. Causes of Cracking During Welding of Aluminium Alloys. (Concluded.) W. I. Pumphrey. *Welding*, v. 18, Jan. 1950, p. 29-32.
Laboratory tests on Al alloys in 11 alloy systems. Cracking may occur at temperatures above or considerably below the solidus of the alloy being welded when the metal is welded under some degree of restraint. 14 ref. (K9, Al)

87-K. Concerning the Tendency of Light-Metal Sheets to Weld Cracking. (In German.) Walter Bulian. *Zeitschrift für Metallkunde*, v. 40, Nov. 1949, p. 427-428.
Experiments show that metals and alloys whose eutectic is below about 600° C. have a tendency to weld-cracking, while those whose eutectic is above 600° C. do not have this tendency. This limit can, however, be raised or lowered by application of lower or higher arc voltages. Examples with ten different alloying additions to pure Al support the theory that weld cracking is caused by melting or grain-boundary substances. (K9, Al)

88-K. Formation of Pores in Welds and Influence of Flux Composition on Tendency Toward Porosity. (In Russian.) I. I. Frumin, I. V. Kirdo, and V. V. Podgretskii. *Avtogennoe Delo* (Welding), Oct. 1949, p. 1-11.
Investigation for low-carbon steel revealed that the main cause of pore formation, particularly during welding of rusty metal, is solution of hydrogen in the high-temperature zone, and its liberation during recrystallization, with subsequent formation of δ-iron. Methods of avoiding such defects by changing composition of flux and conditions of welding. (K9, CN)

89-K. Choice of Optimum Conditions for Flash Welding. (In Russian.) K. P. Imshennik. *Avtogennoe Delo* (Welding), Oct. 1949, p. 12-15.
Diagram based on experimental and theoretical data permits rapid determination of optimum welding conditions for individual cases. (K3)

90-K. Investigation of Thermal Energy of the Flames of Welding Torches. (In Russian.) V. D. Nechaev. *Avtogennoe Delo* (Welding), Oct. 1949, p. 15-19.
Actual limits of regulation imposed by flow rate of acetylene and jet dimensions were investigated. Standardization of welding torches on this basis. (K2)

91-K. Relationship Between Electrical Characteristics and Technological Properties of Spot Welding Machines. (In Russian.) D. S. Balkovets. *Avtogennoe Delo* (Welding), Oct. 1949, p. 27-30.
Technological characteristics of welding machines cannot be accurately judged according to external characteristics, but are most clearly expressed by the relationship of useful power output to load resistance and internal resistance of the machine. (K3)

92-K. Aircomatic Welding Speeds Tank Fabrication. *Iron Age*, v. 165, Feb. 2, 1950, p. 96.
Use in fabrication of aluminum containers. (K1, Al)

93-K. 100 Welded Homes Per Day. *Industry & Welding*, v. 23, Feb. 1950, p. 20-23.
Welding equipment and procedures at Lustron Corp. (K general, T26)

94-K. Design of Silver Alloy Brazed Joints. Part One. Stress Distribution. *Industry & Welding*, v. 23, Feb. 1950, p. 24, 58.
(K8)

95-K. Automatic Test Welding. *Industry & Welding*, v. 23, Feb. 1950, p. 26-27, 30, 60.
Navy-developed automatic arc welders which assure standard electrode test results. (K1)

96-K. The Progress of Structural Welding. Arsham Amirikian. *Industry & Welding*, v. 23, Feb. 1950, p. 36-39, 61, 64-65.
An illustrated survey.
(K general, T26)

97-K. Structural Metal Adhesives for Aircraft. D. A. Shinn. *CADO Technical Data Digest*, v. 15, Feb. 1, 1950, p. 16-18.
Test results and minimum acceptable mechanical properties. 16 ref.
(K12)

98-K. Field Welding H.-P., H.-T. Alloy-Steel Piping. *Combustion*, v. 21, Jan. 1950, p. 36-37.

Series of photos shows steps in welding an alloy steel pipe to a cast steel gate valve and subsequent stress relief. (K general, J1)

99-K. How To Make Consistent Spot Welds. J. Heuschkel and H. Bitzer. *Steel*, v. 126, Feb. 6, 1950, p. 82-86, 110, 112, 114, 116, 118.

See abstract from *Welding Journal*, item 22B-379, 1949. (K3, SS, CN)

100-K. Cold Welding Gets Hot! Clyde B. Clason. *Welding Engineer*, v. 35, Feb. 1950, p. 17-19.

Results of an interview. (K5)

101-K. Welded Blast Furnace Increases Kaiser Capacity by 425,000 Tons. T. B. Jefferson. *Welding Engineer*, v. 35, Feb. 1950, p. 20-21, 26.

Design details and fabrication procedures. (K general, D1)

102-K. Design Considerations in Resistance Welding. II. (Concluded.) Wallace A. Stanley. *Welding Engineer*, v. 35, Feb. 1950, p. 22-26.

Weldability of various metals and alloys—low-carbon steel; stainless and special steels; stainless to carbon steel; aluminum and magnesium; brasses and bronzes; zinc die-cast materials; lead and copper; cast iron, coated metals; nickel and tantalum; tungsten and molybdenum; gold, silver, and platinum; and welding dissimilar metals. (K3, K9)

103-K. 13 Tricks for Better Operation in Oil Fields. Elton Sterrett. *Welding Engineer*, v. 35, Feb. 1950, p. 36-39.

Examples of application of welding to oil-field maintenance and construction jobs. (K general, T28)

104-K. Brackets Welded: Inert-Arc; Metal-Arc. George M. Worden. *Welding Engineer*, v. 35, Feb. 1950, p. 33.

New inert-gas process of welding with a consumable aluminum electrode which paid cost of equipment with one contract. (K1, Al)

105-K. Jobs for Manual Hidden-Arc Welding. C. G. Herbruck. *Welding Engineer*, v. 35, Feb. 1950, p. 34-35.

Four typical jobs at different companies. Advantages. (K1)

106-K. Lincoln's Welded Welding Plant. *Welding Engineer*, v. 35, Feb. 1950, p. 40.

Application of welded steel and aluminum in new Lincoln Electric Co. plant. (K general, T26)

107-K. Welding in an Aircraft-Engine Plant. George H. DeGroat. *Machinery* (American), v. 56, Feb. 1950, p. 153-156.

Techniques employed by Wright Aeronautical Corp. in fabricating velocity turbines for the "Turbo-Cyclone" engine. Various ferrous and nonferrous high-temperature alloys are joined by Heliarc and metal-arc processes. (K1, T24, SG-h)

108-K. Resistance Welding Drops Solar's Production Costs. *Western Metals*, v. 8, Jan. 1950, p. 32.

Some equipment and procedures at Solar Aircraft Co. (K3)

109-K. Weldability of Metals by Resistance Welding Techniques. Wallace A. Stanley. *Product Engineering*, v. 21, Feb. 1950, p. 88-91.

Suitability of various metals, alloys, and plated materials for spot, projection, flash, butt, and seam welding. General precautions, and thickness and shape limitations. Tables of general weldability of metals for resistance welding and recommended electrode materials for spot welding similar and dissimilar metals. (K3)

110-K. Stainless Steel Rivets Improve Joint Strengths in Aluminum. Roy A. Miller. *Product Engineering*, v. 21, Feb. 1950, p. 112-116.

Effects of alloy variations and head shape on strength and upsetting characteristics of stainless-steel rivets, and on fatigue and corrosion resistance of sheets joined by them. (K13, SS, Al)

111-K. Standardized Locomotive Production. E. F. McCaleb. *Steel Processing*, v. 36, Jan. 1950, p. 34-35, 44.

Miscellaneous fabrication procedures, with emphasis on welding, at Locomotive Engineering Div., General Electric Co., Erie, Pa. (T23, K general)

112-K. Welded Construction Applied to Jig and Fixture Building. Wade H. Kerr. *Tool & Die Journal*, v. 15, Feb. 1950, p. 59-60, 88.

How welded construction in jig and fixture work may replace former methods. Two principal examples are welded steel replacing gray-iron castings and welded steel preferred to parts held together by screws, dowels, and rivets. (K general, T5)

113-K. Overseas Assembly; A Review of the Methods and Equipment Developed. *Automobile Engineer*, v. 40, Jan. 1950, p. 9-12.

Welding jigs and fixtures used in assembly after overseas shipment of automotive-body sections made by British firm. (K general, T21)

114-K. Copper Brazing Turned Parts to Mild Steel Sheet. H. E. Lardge. *Machinery* (London), v. 76, Jan. 19, 1950, p. 100. (K8, CN)

115-K. Stability and Design of Welded Structures of Steel A52. (Concluded.) (In French.) Lucien J. Vanderperre and Alexandre Sariban. *Revue de la Soudure; Lastijdschrift*, v. 5, no. 4, 1949, p. 213-228.

Interpolation and extrapolation calculations, and conclusions. (K general, ST)

116-K. Brazing and Welding Methods for Subassemblies. P. H. Brotzman, Lawrence Jacobsmeyer, J. N. Woolrich, and S. M. Spice. *Metal Progress*, v. 57, Feb. 1950, p. 213-219.

Report of an "Economy-in-Production" round-table discussion at the 1949 annual ASM convention. Brotzman discusses silver brazing; Jacobsmeyer, copper brazing and brazing of stainless; Woolrich, aluminum brazing; and Spice, welding. Information concerning production experiences in individual plants. (K8)

117-K. Cold Welding. W. L. Warner. *Metal Progress*, v. 57, Feb. 1950, p. 238, 240, 242, 244, 246, 248.

Condensed from three articles by R. F. Tylecote in *Transactions of the British Welding Research Association*, Nov. 1945, Nov. 1948, and Feb. 1949 (items 22-19, 1946; 22d-74, 1948; 22D-25, 1949); and by V. W. Cooke and A. Levy, *Journal of Metals*, Nov. 1949 (item 22A-254, 1949). (K5, Al)

118-K. Brazing Metals to Nonmetals. *Metal Progress*, v. 57, Feb. 1950, p. 261-262, 264. Condensed from "Metal to Nonmetallic Brazing", C. S. Pearsall and P. K. Zingeser, *Massachusetts Institute of Technology, Research Laboratory of Electronics*, Technical Report No. 104.

See abstract from *Materials & Methods*, item 22A-161, 1949. (K11)

119-K. Hot-Skinning Eliminates Oil-Canning of Thin Sheet Metal. A. L. Schoellerman. *Automotive Industries*, v. 102, Feb. 15, 1950, p. 40-41, 92, 94.

Technique developed by Northrop Aircraft for covering control surfaces exposed to hot exhaust gases with thin sheets of Al or Mg alloy. Thermostatically controlled "heating blankets" are used to eliminate buckling and formation of the defect known as "oil-canning", during the riveting process. The assembly is maintained at 150° F. and held under suitable tension during riveting. (K13, Al, Mg)

120-K. Welding in the Meat Packing Industry. Charles Bonifield. *Welding Journal*, v. 29, Feb. 1950, p. 121-125.

Application of inert-gas-shielded arc welding to stainless steel of 20 gage and heavier to provide handling containers. (K1, SS)

121-K. "Heliarc" Welding in the Automotive Industry. R. H. Bennewitz and F. J. Pilia. *Welding Journal*, v. 29, Feb. 1950, p. 126-136.

Equipment, methods, and procedure. (K1, T21, ST)

122-K. Welded Design of Power Shovels and Buckets. George Bain. *Welding Journal*, v. 29, Feb. 1950, p. 150-153.

Cost comparison between original construction methods and present arc welding shows direct factory savings up to 28% on component parts. Greater design flexibility now permits product changes at considerably less cost. (K1, T4)

123-K. "Deep-Fillet" Technique Is Especially Adapted to A.C. Welding. *Welding Journal*, v. 29, Feb. 1950, p. 153.

Deep penetration into the root of the joint makes it possible to produce smaller fillets with the same strength as larger fillets made by conventional methods. As a result, welding speeds can often be increased considerably. (K1)

124-K. Welded Stanchions for the Barn. L. M. Smith. *Welding Journal*, v. 29, Feb. 1950, p. 154-155.

Stalls made from small-diameter tubing, oxy-acetylene welded. (K2, T3)

125-K. Brazing. *Welding Journal*, v. 29, Feb. 1950, p. 155-156. Reprinted from *Tempil° Topics*, Oct. 1949.

Recommended procedures and applications. (K8)

126-K. Close Tolerance of Gas Welded Assemblies Made Possible by Unusual Rotating Jig. *Welding Journal*, v. 29, Feb. 1950, p. 156.

Jig for holding the three units which make up a welded air-filter part formed from 20-gage cold rolled steel. (K2)

127-K. Correlation of Test Results. C. F. Tipper. *Welding Journal*, v. 29, Feb. 1950, p. 50s-57s; discussion, p. 57s-58s, 73s.

Various types of tests for determining transition temperatures in mild steel plates are evaluated and correlated with the normal tensile test and consideration given to correlation with service experience in welded structures such as ships. 13 ref. (K9, CN)

128-K. Heavy Gage Copper Welded by Inert-Gas-Shielded Arc Process. John D. Kelley. *Materials & Methods*, v. 31, Feb. 1950, p. 57-58.

How fusion welds can now be satisfactorily made on thicknesses up to ⅝ in. (K1, Cu)

129-K. Welding in Bridgework and Allied Structures. R. G. Braithwaite and D. J. Davies. *Transactions of the Institute of Welding*, v. 12, Dec. 1949, p. 143-145.

Methods of design and construction which lead to greater economy. (K21, T26, CN)

130-K. Welding of Aluminium Alloys: Value of Laboratory Tests. *Transactions of the Institute of Welding*, v. 12, Dec. 1949, p. 146-150.

Discussion of paper by W. I. Pumphrey and D. C. Moore (Oct. 1949 issue). (K9, Al)

131-K. Welding Brains Trust. *Transactions of the Institute of Welding*, v. 12, Dec. 1949, p. 151-155.

A condensed report of a question-and-answer session on notch brittleness of steel; factors limiting prefabrication; effect of hydrogen on

weld metal; copper welding; fillet welds in Al; flush patching without backing strips; welding chain links; peening of welds; backing strips on light-gage sheet; stress relief by sunshine; an undercutting problem; war and welding progress; university welding courses; and weld porosity. (K general)

132-K. A Welded Synchrotron. G. C. Poxon and A. G. Thompson. *Welding*, v. 18, Feb. 1950, p. 48-50.

Use of welding in construction of British nuclear-particle accelerator. (K general, T1)

133-K. Fabricated Press Frames. *Welding*, v. 18, Feb. 1950, p. 51-53.

Economies effected by use of automatic welding. Methods and equipment. (K1, CN)

134-K. Mass-Producing Diesel-Electric Locomotives. *Welding*, v. 18, Feb. 1950, p. 54-60.

Welding equipment and procedures of Electro-Motive Div., General Motors Corp. (K general, T23)

135-K. Applications of Ultrasonic Waves. H. O. Willrich. *Welding*, v. 18, Feb. 1950, p. 61-66.

Work of German investigators to discover whether or not ultrasonic waves would improve the quality of spot and arc welds by influencing the formation of the crystal structure. Although the findings are not conclusive, it appears that the treatment may have future possibilities. Ferrous and nonferrous metals were welded. (K1, K3)

136-K. Experimental Study of the Weldability of Steels. R. J. Mouton. *Welding*, v. 18, Jan. 1950, p. 17-27; Feb. 1950, p. 73-82. Translated from the French.

A special form of notch-impact test invented by H. M. Schnadt, a Belgian. The test is being increasingly used on the continent for assessing the serviceability of materials and developing materials with improved properties, for determining weldability, and for forecasting the behavior of structures under service conditions. Second installment: Results of application to three steels, using two different electrodes. (K9, ST)

137-K. Contributions to the Development of Synthetic Rubber Mixtures. Part 2. (Concluded.) (In German.) G. E. Proske. *Kautschuk und Gummi*, v. 1, Aug. 1949, p. 209-211; Sept. 1949, p. 245-246.

Testing of rubber-brass bonds. Effect of various ingredients in Buna-S mixtures; and adhesive solutions as a means of improving adhesion to brass. Sept. issue: Effects of different types of filler on physical and vulcanization properties of synthetic-rubber mixtures. (K11, Cu)

138-K. (Book) **Welding Dictionary.** (English, French, German, and Spanish.) R. N. Thompson and G. Haim. 234 pages. Louis Cassier Co., Ltd., Dorset House, Stamford St., London, S.E.1, England. 21s. net.

In addition to the large number of terms specifically related to welding, many expressions pertaining to electrical and mechanical engineering and to metallurgy are included. (K general)

139-K. (Book) **Economics of Welding Processes Applied to Tube Production.** (In German.) F. W. Griese. 88 pages. Friedr. Vieweg & Sohn, Braunschweig, Germany. 6.8 DM.

Relative costs of several different welding processes when applied to the fabrication of tubes, pipes, and cylindrical bodies. Limitations and advantages of the various methods, chiefly from the viewpoints of speed and cost. Limited to the low-carbon steels. (K general, CN)

L

CLEANING, COATING AND FINISHING

73-L. Aluminum Coating of Steel—A Comparison of Various Processes. P. T. Stroup and G. A. Purdy. *Metal Progress*, v. 57, Jan. 1950, p. 59-63, 128, 130.

Steel can be coated with Al by hot dipping, cladding, electroplating, spraying, chemical reaction, and calorizing. Importance of controlling the thickness of the Fe-Al compound that forms between the base metal and the coating. The six methods of coating are compared on the basis of structure and cost. 29 ref. (L general, ST, Al)

74-L. Elements of Metal Cleaning—for the Fabricator. Adolph Bregman. *Metal Progress*, v. 57, Jan. 1950, p. 75-78.

Complexity of the problem. First of a series. (L general)

75-L. Chlorinated Rubber in the Paint Industry. B. S. Giovani. *Paint Manufacture*, v. 29, Dec. 1949, p. 419-424.

Use of chlorinated rubber paints for noninflammability and resistance to water, water vapor, and various corrosive vapors and liquids. Use for protection of iron and steel structures against fumes. 21 ref. (L26, Fe)

76-L. Adhesion and Application of Organic Coatings to Metal. B. M. Letsky. *Paint Manufacture*, v. 19, Dec. 1949, p. 425-426, 434.

Investigation of the thermodynamic changes which occur during the wetting of metallic powders and oxides by organic liquids and media. "Adherometer" developed to measure force of adhesion of organic coatings. (L26)

77-L. Uses of Electroplating. *Steel*, v. 126, Jan. 23, 1950, p. 78. Based on paper by W. M. Phillips.

Automotive applications. (L17, T21)

78-L. Hard-Facing Tool Joints. *Oil and Gas Journal*, v. 48, Jan. 19, 1950, p. 77.

Portable unit recently placed in field service for California drilling contractors. (L24)

79-L. Combination Electric Infra-Red and Gas Oven Bakes Paint on Aluminum. William J. Miskella. *Industrial Finishing*, v. 26, Jan. 1950, p. 10-12, 17-18, 20, 22.

Setup developed for cleaning, surface treating, roller coating, baking the finish, and forming aluminum strips into siding of cut lengths, with nail holes punched. (L26, Al)

80-L. Pan Cleaning and Glazing. James F. Nolan. *Industrial Finishing*, v. 26, Jan. 1950, p. 26-28, 30, 33-34.

Equipment and procedures for cleaning and glazing the pans used in bakeries. The glaze is a silicone coating. (L26, T10)

81-L. Ditto Duplicating Machines Finished in Wrinkle Enamel. John P. Kennedy. *Industrial Finishing*, v. 26, Jan. 1950, p. 38, 40, 42.

Equipment and procedures. Parts are of steel or of die-cast Zn. Includes precleaning. (L26, ST, Zn)

82-L. XLN Magnet Wire Enamel. Robert Lippe and Wallace G. Hope. *Wire and Wire Products*, v. 25, Jan. 1950, p. 40-43, 93.

Linear-polyester wire-coating enamel can be applied without dies in a conventional wire-coating tower. Comparative properties of wire coated with this enamel and with other materials. Typical test results. (L26, Cu)

83-L. Radioactive Tracers Used To Study Plating Process. *Technical News Bulletin*, National Bureau of Standards, v. 34, Jan. 1950, p. 4-5.

Condensed from *Journal of the Electrochemical Society*. See item 23-L, 1950. (L17, S19, Cr)

84-L. Review of 1949 Developments in Organic Finishing. Ferdinand C. Wehrman. *Organic Finishing*, v. 11, Jan. 1950, p. 8, 10-11.

22 references. (L26)

85-L. Production Pickle at Ryan. James R. Langham. *Western Machinery and Steel World*, v. 41, Jan. 1950, p. 82-85, 102.

Development of suitable pickling-bath compositions and production-line system for 18-8 stainless, 19-9-DL, and Inconel. It was necessary to do this with a maximum of five tanks. (L12, SS, Ni)

86-L. A Rapid Method of Determining Sulphuric Acid in Chromium Plating Electrolytes. V. A. Il'in. *Electroplating and Metal Finishing*, v. 3, Dec. 1949, p. 130-131.

Translated from *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, 1948, p. 1389-1390. (L17, S11, Cr)

87-L. Nonferrous Metals Given High Finish by New Chemical Polishing Process. T. C. Du Mond. *Materials & Methods*, v. 31, Jan. 1950, p. 59-61.

New low-cost acid-dip process, developed at Battelle Memorial Institute, which promises to find wide use, especially for polishing intricately shaped parts. Materials successfully polished include Cu, Ni, Al, and alloys. (L12, Cu, Ni, Al)

88-L. Surface Treatment of Diesel Engine Parts. *Journal of the American Society of Naval Engineers*, v. 61, Nov. 1949, p. 887-891. Reprinted from *Motorship*, Oct. 1949.

Methods for treatment of metal surfaces to retard effects of wear. Emphasizes use of phosphate coatings. (L14, CI, ST)

89-L. Metallizing in Relation to Marine Engineering. J. Barrington Stiles. *Journal of the American Society of Naval Engineers*, v. 61, Nov. 1949, p. 923-951. Reprinted from *Transactions of the Institute of Marine Engineers*, v. 60, no. 12, 1948.

The equipment, the process, properties of the different metals which are sprayed, shaft preparation, applications, and associated operations. (L23, T22)

90-L. Continuous Electrolytic Process Makes Tin Plate. *Canadian Metals*, v. 13, Jan. 1950, p. 8-11.

Includes cold rolling, annealing, cleaning and plating. (L17, Sn)

91-L. Reclaiming a Crown Gear. Donn Boring. *Canadian Metals*, v. 13, Jan. 1950, p. 36-37.

Procedure by which a large cast-iron gear with only a few teeth intact was reclaimed by build-up welding and subsequent machining. (L24, CI)

92-L. Alodizing Makes Aluminum Ideal for Chimney Liners. *Modern Metals*, v. 5, Jan. 1950, p. 30-32.

Process for treating Al chimney liners prior to application of resin-base paint. (L14, Al)

93-L. Electroplated Tin-Zinc Alloy Coatings on Iron and Steel Components. E. E. Halls. *Metallurgia*, v. 41, Dec. 1949, p. 68-73.

Details of plating process and results of comparative corrosion tests. Usual compositions are 50-50 and 80-20 Sn-Zn. (L17, Sn, Zn)

94-L. Tin Plate. Part I. A Glance at Hot Dipped and Electrolytic Tin Plate. Part II. Coating of Hot Dipped Tin Plate. John N. Crombie. *American*

Iron and Steel Institute, "Technical Committee Activities", 1949, p. 129-171.
The hot-tinning operation and problems involved. 24 ref. (L16, Sn)

95-L. Notes on Nickel Plating From a Fluoborate Bath. E. J. Roehl and W. A. Wesley. *Plating*, v. 37, Feb. 1950, p. 142-146, 171.
Behavior of a nickel fluoborate electrolyte containing excess boric acid indicates that the fluoborate solution is a practical, easily controlled bath for production of sound nickel deposits of moderate stress and high ductility. 11 ref. (L17, Ni)

96-L. Modernizing a Plating Room. *Plating*, v. 37, Feb. 1950, p. 148-152.
Picture story shows improvements achieved by extensive modernization. (L17)

97-L. Electrocoloring of Stainless Steels in Aqueous Solutions. C. E. Naylor. *Plating*, v. 37, Feb. 1950, p. 153-154, 159-160, 171.
Various methods using modified H_2SO_4 solutions. Results of experiments conducted to determine the best procedure. An electrolytic method was found to be the most satisfactory. (L14, SS)

98-L. Electrodeposition of Alloys of Phosphorus and Nickel or Cobalt. (Concluded.) Abner Brenner, Dwight E. Couch, and Eugenia Kellogg Williams. *Plating*, v. 37, Feb. 1950, p. 161-164.
Results of determination of stresses; chemical attack by HCl and HNO_3, and by salt spray; and microstructure. Possible applications. 10 ref. (L17, Co, Ni)

99-L. Determination of Impurities in Electroplating Solutions. XVII. Traces of Lead in Copper Plating Baths. Earl J. Serfass, W. S. Levine, and Mary H. Perry. *Plating*, v. 37, Feb. 1950, p. 166-170.
After organic material is oxidized with phosphoric acid, the lead is separated from interfering ions by extracting with a CCl_4 solution of dithizone in the presence of KCN. After removal of excess dithizone with alkaline KCN, transmittance of the solution is measured and determined from a calibration curve. (L17, S11)

100-L. Steel Shot Speeds Blast Cleaning; Shot Peening. L. J. Wieschhaus. *Iron Age*, v. 165, Feb. 2, 1950, p. 82-85.
Newly developed cast-steel shot which causes less wear on equipment, lasts longer, and eliminates some pickling. Production methods and comparative resistance to fracture based on service tests. (L10, T5, CI)

101-L. Northrop Develops New Aluminum Primer. K. B. Niles. *Iron Age*, v. 165, Feb. 2, 1950, p. 90-92.
Properties of synthetic-resin primer which gives more corrosion protection for Al and Mg and also improves appearance and furnishes better lacquer base than zinc chromate. (L26, Al, Mg)

102-L. Standard Space Heater Improves Drying Tower. Rod Luttgen and E. M. Tarnoff. *Iron Age*, v. 165, Feb. 2, 1950, p. 93-95.
Use of modified standard unit to dry Zn plating and lacquer finishes on woven-wire fabrics. Productive capacity is increased by 25%. Elimination of tackiness avoids frequent shutdowns to clean rollers. (L general)

103-L. Paint, Plating, and Porcelain Protect and Beautify Display Cases. Ezra A. Blount. *Products Finishing*, v. 14, Feb. 1950, p. 12-18, 20, 22, 24, 26, 30, 32, 34.
How different surface finishes are applied to various component parts which are assembled to produce refrigerators and display cases. (L general)

104-L. A Study of Heat Resisting Finishes. George Black. *Products Finishing*, v. 14, Feb. 1950, p. 38-40, 42.
Comparative investigation of heat-resistant paints under a variety of service conditions. Table shows formulations successfully passing heat tests on metal surfaces up to 950 and 1150° F. (L26)

105-L. Radioactive Tracers Used To Study Plating Process. *Products Finishing*, v. 14, Feb. 1950, p. 42, 44, 46, 48; *Iron Age*, v. 165, Feb. 2, 1950, p. 89.
See abstract of article by Fielding Ogburn and Abner Brenner in *Journal of the Electrochemical Society*, item 23-L, 1950. (L17, S19, Cr)

106-L. Conversion Coatings on Zinc. Vincent Mattacotti. *Products Finishing*, v. 14, Feb. 1950, p. 52-54, 56, 58, 60, 62, 64, 66, 68, 70, 72.
Various methods; results of salt-spray tests. (L general Zn)

107-L. Recent Developments in Metal Polishing. Allen G. Gray. *Products Finishing*, v. 14, Feb. 1950, p. 74, 76, 78, 80, 82, 84, 86, 88, 90. Based on papers by J. B. Aust and by Wm. A. Corse.
Emphasis on new mechanical polishing equipment. (L10)

108-L. Electroformed Masks for Production Painting. Val Jones. *Production Engineering & Management*, v. 25, Feb. 1950, p. 43-45.
Electroformed masks for painting intricate designs on embossed surfaces at high production rates. Application to the Oldsmobile hubcap. (L18, L26)

109-L. Continuous Zinc Coating Units. H. W. Lynn. *Industrial Heating*, v. 17, Jan. 1950, p. 74-76, 78, 174.
Condensed from paper delivered in 1944 at 22nd meeting of Galvanizers' Committee, American Zinc Institute. (L16, Zn)

110-L. Titanium in Porcelain Enamels. G. H. Spencer-Strong and Robert F. Patrick. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 253-256.
Development of titanium-opacified enamels and their physical properties. Application directly to the metal without need for a ground-coat. 17 ref. (L27, Ti)

111-L. Preventing Defects in Enameling Holloware. Part XI. Defects in Speckled Ware. F. A. Petersen. *Ceramic Industry*, v. 54, Feb. 1950, p. 45, 49.
Causes and preventive measures. (L27)

112-L. Manufacturing Metallized Picture Tubes. Earl R. Ewald. *Electronics*, v. 23, Feb. 1950, p. 76-79.
Techniques by which the phosphor coating of a television picture-tube screen is covered by a membrane or film on which a thin mirror-like coating of aluminum is evaporated. Membrane is later removed by heat before final evacuation. (L25, Al)

113-L. Silicone Surface Coatings. M. A. Glaser. *Product Engineering*, v. 21, Feb. 1950, p. 109-111.
Specifications, physical and chemical properties, and applications. Effects of elevated temperatures, moisture, and electrical forces on silicone coatings applied to metallic bases. (L26)

114-L. Factors Influencing Oxidation of Iron During Firing of Ground-Coat Enamels. Robert F. Kimpel and Ralph L. Cook. *Journal of the American Ceramic Society*, v. 33, Feb. 1, 1950, p. 57-62.
Oxidation beneath a ground-coat enamel was measured by recording progressive weight change on heating from room temperature to 1550° F. and correcting for volatile constituents. Permeability of the dry, unfired enamel films was correlated with variables characteristic of ground-coat enamel slips. (L27, Fe)

115-L. Corrosion Resistance Treatment for Zinc Die Castings. *Iron Age*, v. 165, Feb. 9, 1950, p. 83.
Proprietary chemical treatment which not only increases resistance to surface corrosion, but also serves as a good preparation for enameling. (L14, Zn)

116-L. Abrasive-Belt Finishing. W. A. Papworth. *Machinery* (American), v. 56, Feb. 1950, p. 141-148.
Some applications. (L10)

117-L. Preparing Shafts for Metallizing. John E. Wakefield. *Machinery* (American), v. 56, Feb. 1950, p. 174-177.
Correct preparation of base metal is the most important factor in successful spraying of metal. The surface must be cleaned thoroughly, and must be roughened in such a way that there will be hooks and craters for the molten particles of sprayed metal to key into. Six methods of roughening shafts prior to metallizing. (L23, ST)

118-L. Finishes for Aluminum. *Die Castings*, v. 8, Feb. 1950, p. 45-46, 50.
The range of finishes available for product designer and engineer. (L general, Al)

119-L. Electrodeposition of Chromium-Tungsten Alloy Plates. Donald G. Rogers and Arthur A. Burr. *Journal of the Electrochemical Society*, v. 97, Feb. 1950, p. 67-69.
Alloy plates of Cr and W of thicknesses up to nearly 0.0001 in. were deposited at a temperature of 60-75°C. The plates have excellent appearance and resistance to corrosion by any of the common inorganic acids. (L17, Cr, W)

120-L. A Review of the Electrochemistry of Stressed Metals. M. T. Simnad. *Journal of the Electrochemical Society*, v. 97, Feb. 1950, p. 31C-44C.
Origin and nature of internal stresses; latent energy in deformed metals; influence of stress on electrode potential and corrosion rate; effect of surface preparation on corrosion; stress-corrosion of ferrous and nonferrous metals; corrosion fatigue; and internal stresses in electrodeposited metals. 256 ref. (L17, Q25)

121-L. Silicones in the Protective Coating Industry. John J. Tyner. *Finish*, v. 7, Feb. 1950, p. 30-32, 66.
Use of silicone-resin coatings for protection of metal surfaces against moisture, weathering, high temperatures, and chemicals. Chemistry, properties, and other applications. (L26)

122-L. The Porcelain Enameled Shingle in Residential and Special Purpose Construction. R. B. Schall and K. M. Gibbs. *Enamelist*, v. 26, Winter 1949-50, p. 3-7.
Fabrication, installation, properties, and economic factors. (L27, T26)

123-L. Organic Finishes and Their Application. Ellery G. Harris. *Enamelist*, v. 26, Winter 1949-50, p. 15-18.
Various types of wrinkle, hammer, and other specialty finishes. Application procedures. (L26)

124-L. Control of Electroplating Solutions by Analysis and Observation. XI. Control of Chromium Plating Solutions. K. E. Langford. *Electroplating and Metal Finishing*, v. 3, Jan. 1950, p. 166-168.
Methods for determination of chromic acid and of sulfate ion. (L17, Cr)

125-L. Fume Elimination for Wire Enameling Ovens. R. J. Ruff. *Wire and Wire Products*, v. 25, Feb. 1950, p. 131-132, 172-173.
Various methods and details of the catalytic-incineration procedure and equipment. Operating results. (L26, A7)

126-L. Electroplating and Electropol-

ishing. *Chemical Age*, v. 62, Jan. 14, 1950, p. 83-88.

Reviews 1949 developments. (L17, L13)

127-L. Mechanism of Electropolishing. T. P. Hoar and J. A. S. Moway. *Nature*, v. 165, Jan. 14, 1950, p. 64-65.

Studies in the electropolishing of nickel have led to formulation of a hypothesis for its mechanism, which may prove to have general application. (L13, Ni)

128-L. From a Metallurgist's Notebook: Cadmium Plating Defects. H. H. Symonds. *Metal Industry*, v. 76, Jan. 20, 1950, p. 43-44.

Determination of the origin of certain spots on Cd-plated steel shutters. Spotting was caused by accidental application of a corrosive liquid carried in finely divided form in the atmosphere. (L17, Cd)

129-L. A New Wire Enameling Process. H. Martin. *Machinery Lloyd* (Overseas Edition), v. 22, Jan. 7, 1950, p. 83-85.

Kobor process developed in Hungary. The enamel is applied in multiple-layer formation, each layer being heated and set previous to the application of the next one. The method is applicable primarily to small copper conductors. (L26, Cu)

130-L. Influence of Concentration of Electrolyte on the Production of Ultraviolet Radiation During Anodic Oxidation of Aluminum. (In French.) R. Domansky. *Collection of Czechoslovak Chemical Communications*, v. 14, nos. 8-10, 1949, p. 441-444.

Experimental data which show that the intensity of ultraviolet radiation diminishes with concentration of certain common acidic and basic electrolytes and at a definite concentration ceases to be detectable. It is believed that this phenomenon is the cause of the formation of nonconducting layers in very dilute solutions. (L19, Al)

131-L. Nickel and Chromium Plating Compared. Jerome L. Bleiweis. *Metal Progress*, v. 57, Feb. 1950, p. 200-202.

Surveys the two processes, their properties, and applications. (L17, Ni, Cr)

132-L. Self Regulating Solution Speeds Chromium Plating. William Czygan. *Iron Age*, v. 165, Feb. 16, 1950, p. 91-93.

Increases of 30-50% in cathode efficiency, permitting shorter plating time or thicker deposits in the same plating times, are reported by shops using Unichrome SRHS solution. The bath is automatically self-regulating, eliminating the need for chemical analysis. Other advantages include better covering power and less sensitivity to current interruptions. (L17, Cr)

133-L. Protective Coatings for Weathered Galvanized Sheets. M. L. Burgener and Deane G. Carter. *Agricultural Engineering*, v. 31, Feb. 1950, p. 67-70.

Experimental test program conducted by American Zinc Institute since 1932, using a wide variety of paints and metal-pigment coatings. (L26, Zn)

134-L. Electrically Operated Hot Vapor Degreaser Solves a Cleaning Problem. *INCO Magazine*, v. 23, Winter 1950, p. 13, 28.

Ni-clad degreaser which can handle 3000 lb. of metal parts per hour. Flexibility makes it useful for items of many different sizes. (L12, Ni)

135-L. The Painting, Enamelling and Lacquering of Light Metals. *Light Metals*, v. 13, Jan. 1950, p. 32-37; Feb. 1950, p. 84-92.

Requirements and procedures for application of coatings to Al, Mg and their alloys. Jan. issue: The difference between light alloys and the heavy nonferrous metals and steel with respect to painted coatings and cleaning procedures. Feb. issue: Chemical and electrochemical pretreatments, and priming and finishing paints for Al and Mg. (L26, Al, Mg)

136-L. Elimination of Paint Peeling. Jerome L. Bleiweis. *Organic Finishing*, v. 11, Feb. 1950, p. 9-13.

Case history relating to the elimination of paint peeling on Al-base alloys in an aircraft plant. Investigation of causes and methods adopted to alleviate the problem. (L26, Al)

137-L. Surface Preparation for Paint Finishing. S. Markay. *Organic Finishing*, v. 11, Feb. 1950, p. 18-19.

Equipment and procedures of White Motor Co. (L26, ST)

138-L. Revamped Production Facilities Boost Pipe Galvanizing 30%. Dan Reebel. *Steel*, v. 126, Feb. 20, 1950, p. 84-86.

Novel handling arrangement, which utilizes four permanently magnetic carrier rolls set in tandem for double drag-out of pipe from the galvanizing pot. Large savings in Zn consumption are claimed. (L15, Zn, ST)

139-L. Pulsed Current Electroplating; Some New Developments in the Application of Alternating Current to the Plating and Smoothing of Deposits. *Electroplating and Metal Finishing*, v. 3, Jan. 1950, p. 171-174.

Gives general principles and specific examples, including bath composition, electrical conditions, times, and temperatures. (To be continued.) (L17)

140-L. Modern Developments in Metal Finishing. Recent Developments in Electrodeposition Processes. Recent Developments in Plant for Electrodeposition. E. A. Ollard. **Phosphate Treatments for Iron and Steel Surfaces.** H. A. Holden. *Electroplating and Metal Finishing*, v. 3, Feb. 1950, p. 208-211, 213-214.

First three of a series of 8 lectures. (To be continued.) (L17, L14)

141-L. Economical Degreasing With Emulsifiable Solvent Cleaners. *Electroplating and Metal Finishing*, v. 3, Feb. 1950, p. 215-216.

Emphasis on products made by a British firm. (L12)

142-L. Surface Treatment and Finishing of Light Metals. Part 5. (Continued.) S. Wernick and R. Pinner. *Sheet Metal Industries*, v. 27, Jan. 1950, p. 71-81.

Chemical conversion coatings for aluminum and its alloys, history of chemical oxide coatings, theory of chemical oxidation, and the proprietary processes known as "M. B. V." and "E. W.". 26 ref. (To be continued.) (L14, Al)

143-L. Vinyl Coatings for the Metal Decorator. Joseph M. Perrone and Edward R. Lawson. *National Lithographer*, v. 57, Jan. 1950, p. 32-33, 60-61.

History and development. (To be concluded.) (L26)

144-L. Barrel Tumbling of Parts Prior to Finishing. Edward Engel. *Tool Engineer*, v. 24, Feb. 1950, p. 40-42. (L 10)

145-L. Deep-Drawing Galvanized Steel Retains Corrosion Resistance After Forming. Kenneth Rose. *Materials & Methods*, v. 31, Feb. 1950, p. 63-64.

Method of cleaning and applying a special Zn coating to flat steel strip which has made practical the use of galvanized stock for deep-drawn parts. (L16, Zn)

146-L. Porcelain Enamels. H. R. Clauser. *Materials & Methods*, v. 31, Feb. 1950, p. 71-82.

What porcelain enamels are and what they can and cannot do. Introduction; characteristics of porcelain enamels; types of porcelain enamels; and metals for porcelain enameling. (L27)

147-L. Trend to Intermediately Fired Porcelain Enamels. John L. McLaughlin. *Better Enameling*, v. 21, Feb. 1950, p. 6-7, 22-23.

Advantages of 1450° F. titanium enamels. Weight of application vs. reflectance curves for 1450° Ti and 1520° Zr enamels are presented and discussed. (L27)

148-L. Trouble Shootin'. John L. McLaughlin. *Better Enameling*, v. 21, Feb. 1950, p. 36.

Porcelain-enamel defect known as "poppers". (L27)

149-L. Throwing Power; Open Discussion at E.T.S. Meeting. *Metal Industry*, v. 76, Jan. 13, 1950, p. 28-29; Jan. 27, 1950, p. 65-67.

Discussion at recent London meeting of Electrodepositors' Technical Society. (L17)

150-L. From a Metallurgist's Notebook: Flaking of Enamel. H. H. Symonds. *Metal Industry*, v. 76, Jan. 27, 1950, p. 63-64.

Trouble was encountered with enameled cast-brass letters on account of exfoliation. Results of metallurgical examination indicate that the trouble was caused by surface oxide and corrosion products destroying the adhesion. Various suggestions to prevent further occurrence of the difficulty. (L26, Cu)

151-L. De-Enamelling. Bernard B. Kent. *Foundry Trade Journal*, v. 88, Feb. 2, 1950, p. 123-126.

Various methods available and their advantages and disadvantages in the light of personal experience with vitreous enameling. (L27)

152-L. Metal Cleaning: Bibliographic Abstracts. Jay C. Harris, Ed. 68 pages. Special Technical Publication No. 90, American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $2.00 to A.S.T.M. members; $2.75 to nonmembers.

A convenient manual of 494 abstract references on metal cleaning, including patents. The articles are arranged first by year, and then by author, or where anonymous, by journal. With one earlier exception, the references start with 1922. Where possible, original articles have been abstracted; others are reprinted from other abstract journals. Accompanied by complete author, subject and patent indexes.—E.C.S. (L10, L12, L13)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

37-M. Improved Techniques for Examination of Structure. Arthur L. LaMasters. *Metal Progress*, v. 57, Jan. 1950, p. 80.

Procedure for taking full-sized macrographs of large castings. Photomicrographs can then be taken of any desired portions and accurately located for comparison. (M28)

38-M. A New Type of Crystal Goniometer Head. W. A. Rachinger. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, Dec. 1949, p. 411-412.

Apparatus was designed so that large metallic crystals, in the form of flat strip, can be set in such a position that certain high-angle monochromatic X-ray reflections can be obtained. (M23)

39-M. Instrument for Measurement of X-Ray Diffraction Patterns. John

A. Bennett. *Review of Scientific Instruments*, v. 20, Dec. 1949, p. 908-910.

Instrument for measuring back-reflection patterns for surface-stress determinations is at least as precise as a photomicrometer and saves time. (M22)

40-M. A Photomicrometer for X-Ray Diffraction Measurements. *Technical News Bulletin* (National Bureau of Standards), v. 34, Jan. 1950, p. 3-4.

Condensed from "Instrument for Measurement of X-Ray Diffraction Patterns", John A. Bennett, *Review of Scientific Instruments*. See item 39-M, 1950. (M22)

41-M. The Detection of Overheating and Burning in Steel by Microscopical Methods. A. Preece and J. Nutting. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 46-50.

Etching reagents which have been used to detect overheating and burning in steel. Action of an electrolytic ammonium nitrate etch, and a theory advanced for its differential action. 11 ref. (M21, ST)

42-M. Microradiography and Metals. W. Betteridge. *Metal Industry*, v. 76, Jan. 6, 1950, p. 5-8.

Techniques; diagrams and microradiographs of steels and cast iron. The method is said to be particularly applicable to steels. (M23, ST, CI)

43-M. Metallurgical Applications of the Electron Microscope; Report on Recent Symposium. G. A. Geach. *Metallurgia*, v. 41, Dec. 1949, p. 115-120.

Reviews 14 papers presented at symposium by the Institute of Metals in Nov. 1949. (M21)

44-M. Crystal Structure of Pt_2Sn_3. (In German.) Konrad Schubert and Hermann Pfisterer. *Zeitschrift für Metallkunde*, v. 40, Nov. 1949, p. 405-411.

X-ray investigation to determine atomic dimensions of the above compound as well as of various phases of the Pt-Sn system. Effect of heat treatment. (M26, N9, Pt, Sn)

45-M. Investigation of Structures of Metallic Films Obtained on the Surface of Aqueous Solutions of Salts and Metals by the Action of Gaseous Reducing Agents. I. Structure of Platinum Films. (In Russian.) N. N. Buinov, N. V. Demenev, A. S. Shur, and G. G. Fedorova. *Kolloidnyi Zhurnal* (Colloid Journal), v. 11, Sept.-Oct. 1949, p. 289-298.

Experimental investigation revealed that the structure of Pt films changes with their thickness, i.e., with time of reduction. Films consisting of individual elementary crystals are obtained with increased reduction time. 11 ref. (M26, Pt)

46-M. The Alloy Systems Uranium-Aluminum and Uranium-Iron. Paul Gordon and A. R. Kaufman. *U. S. Atomic Energy Commission*, AECD 2683, Aug. 26, 1949, 31 pages.

Previously abstracted from *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*. See item 14-M, 1950. (M24, U)

47-M. The Iron-Nitrogen System. V. G. Paranjpe, Morris Cohen, M. B. Bever, and C. F. Floe. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 261-267.

Investigated by X-ray diffraction measurements and a controlled nitrogenizing method. The latter depends on the relation between the nitrogenizing power of an NH_3-H_2 mixture and the N_2 content of the Fe-N alloy produced. Several heretofore controversial features of the Fe-N phase diagram are clarified. 17 ref. (M24, Fe, N)

48-M. A Study of the Iron-Chromium-Nickel Ternary System. J. W. Pugh and J. D. Nisbet. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 268-276.

Fe-Cr-Ni phase relationships in 55 alloys were studied by means of hardness, elongation, tensile strength, dilatometer indications, and microstructure analysis. 15 ref. (M24, Fe, Cr, Ni)

49-M. Special Mounting Techniques. Earl C. Roberts. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 353.

Two simple techniques. The first proved very satisfactory for the study of untempered martensite. The second was required for the study of slag specimens by reflected light. (M21)

50-M. Microstructure of Iron-Silicon Alloys As Developed by the Powder Metallurgy Process. R. Wachtell. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 354-360.

A succession of micrographs shows portion of the diffusion process occurring in Fe-Si powder compacts. Metallographic characteristics of Fe-Si alloys (especially in the 6% Si range), compounded by the powder process; various misleading pseudomorphic structures encountered. An etch which indicates Si content within rather wide ranges. 17 ref. (M27, H general, Fe)

51-M. Measurement of Relative Interface Energies in Twin Related Crystals. C. G. Dunn, F. W. Daniels, and M. J. Bolton. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 368-377.

The nature of boundaries in twin related grains of Si iron was investigated and the relative interface energy of the (112) twin was determined. Effect of boundary orientation on boundary energy. Mathematical and experimental techniques. 11 ref. (M27, Fe)

52-M. Electrolytic Polishing of Copper. *Iron Age*, v. 165, Feb. 2, 1950, p. 89.

Condensed from "Electrolytic Polishing and Short-Circuit Etching of Copper and Cuprous Alloys", M. Jaroszewicz-Bortnowski and J. Schoofs.

Previously abstracted from *Engineers' Digest*. See item 11-389, 1949. (M21, Cu)

53-M. Fractographic Studies of Ingot Iron. *Iron Age*, v. 165, Feb. 2, 1950, p. 95. Based on "Fractographic Study of Deformation and Cleavage in Ingot Iron", C. A. Zapffe and C. O. Worden.

Previously abstracted from *American Society for Metals*, Preprint No. 31, 1949. See item 4B-95, 1949. (M23, Q24, Fe)

54-M. The Structure of Cerium at the Temperature of Liquid Air. A. F. Schuch and J. H. Sturdivant. *Journal of Chemical Physics*, v. 18, Jan. 1950, p. 145.

The data show the presence in quenched cerium at 90° K. of two phases. One is the normally contracted room-temperature form. The other is an anomalously contracted phase which is also face-centered cubic. Its cell edge of 4.82Å represents a 16.5% decrease in volume below that of the parent structure. (M26, Ce)

55-M. X-Ray Measurement of Order in Single Crystals of Cu_3Au. J. M. Cowley. *Journal of Applied Physics*, v. 21, Jan. 1950, p. 24-30.

X-ray diffraction methods were used to measure long and short-range order parameters at elevated temperatures. Short-range parameters are given for the first ten shells of atoms surrounding a given atom for three temperatures above the critical temperature of Cu_3Au. These results, and those for long-range order parameter agree well with theoretical predictions. 13 ref. (M26, Cu, Au)

56-M. The Identification of Solid Corrosion Products. C. M. Schwartz. *Corrosion*, v. 6, Feb. 1950, p. xi.

Program of NACE Technical Practices Committee TP-11, on Identification of Corrosion Products. (M27, R general)

57-M. Optical Metallography of Titanium. Walter L. Finlay, John Resketo, and Milton B. Vordahl. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 218-222.

Special characteristics of Ti which are of controlling importance in its optical metallography. Metallographic techniques and typical microstructures of commercially pure unalloyed Ti in a variety of metallurgical conditions. Structures of Ti-base alloys. (M21, Ti)

58-M. Recording Dilatometer for Measuring Thermal Expansion of Solids. John C. Turnbull. *Journal of the American Ceramic Society*, v. 33, Feb. 1, 1950, p. 54-56.

Instrument in which a resistance strain gage is used to measure linear thermal expansion. The recording feature is obtained with a conventional recording potentiometer that prints strain-gage output directly, together with sample temperature. 11 ref. (M23)

59-M. X-Rays and Microscopical Metallography. A. J. Bradley. *Metal Industry*, v. 76, Jan. 20, 1950, p. 49-53.

Investigation of the Fe-Ni-Al system, an equilibrium diagram being constructed for the 750-1350° C. region. Results indicate that the X-ray method is most useful for rapid preliminary survey of an unknown equilibrium diagram. However, accurate and careful delineation of phase boundaries at a series of temperatures is most easily carried out by means of the optical microscope. (M22)

60-M. The Constitution of the Silver-Rich Silver-Magnesium-Zinc Alloys. G. V. Raynor and R. A. Smith. *Journal of the Institute of Metals*, v. 76, Dec. 1949, p. 389-406.

Examined by micrographic methods, with confirmatory X-ray experiments. Isothermals were established at 650, 450, and 250° C. Form of the β-γ equilibria in relation to atomic size effects and electron-atom ratios. 12 ref. (M24, Ag)

61-M. Sub-Crystals in Aluminium Observed With Polarized Light. D. McLean, A. E. L. Tate, and M. H. Farmer. *Nature*, v. 165, Jan. 14, 1950, p. 70.

Evidence for breakdown of the original crystals into sub-crystals under certain conditions of deformation. (M26, Al)

62-M. Measurement of the Parameters of Cubic Polycrystals on the Basis of Debye-Scherrer Diagrams. (In French.) *Comptes Rendus* (France), v. 229, Dec. 5, 1949, p. 1242-1244.

Proposes a new graphic method characterized by simplicity and accuracy. Use of a standard sample is unnecessary. Typical measurements on aluminum (99.998% pure) illustrate the procedure. (M22, Al)

63-M. Inclusions and Grain-Boundary Materials in Steel. (In German.) Rudolf Schäfer. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 349-353.

How oxide inclusions in the form of suspensions and grain-boundary materials can be made visible under the microscope by use of a weak (0.15-0.20%) alcoholic iodine solution. This metallographic method

permits study of the effect of various factors on formation of inclusions. The advantages of deoxidizing with Al, of shallow baths, and of refining in electric furnaces. (M21, D general, ST)

64-M. The Crystal Structure of $Mg_3Cu_2Al_3$. (In German.) Sten Samson. *Acta Chemica Scandinavica*, v. 3, no. 8, 1949, p. 809-834.

Detailed structural analysis of a phase which has been assigned the composition $Mg_3Cu_2Al_{12}$, was performed with the aid of a Patterson projection and X-ray powder diffraction. The elementary cell is shown to consist of three units of $Mg_3Cu_2Al_3$. (M26,Cu)

65-M. The Crystal Structure of Mg_2Zn_{11}; Isomorphism Between Mg_2Zn_{11} and $Mg_3Cu_2Al_3$. (In German.) Sten Samson. *Acta Chemica Scandinavica*, v. 3, no. 8, 1949, p. 835-843.

It was determined by complete structural analysis that the above two phases are isomorphous. Includes detailed powder-photograph data. (M26, Zn, Cu)

66-M. X-Ray Camera for Photographing Inverse Lattices. (In Russian.) Yu. A. Bagaryatskii and M. M. Umanskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Nov. 1949, p. 1320-1328.

Newly developed X-ray diffraction camera for investigation of crystal structure. (M22)

67-M. Method of X-Ray Investigation of Structural Changes During Aging of Coarse-Grained Polycrystalline Alloys. (In Russian.) A. M. Elistratov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 21, 1949, p. 337-340.

Method of interpretation of X-ray diffraction patterns for the above alloys. Schematic drawings explain the technique of calculation of crystallographic constants. (M22)

68-M. Metallographic Technique for Steel; Action of Miscellaneous Etchants. *Metal Progress*, v. 57, Feb. 1950, p. 212-B.

Last of six data sheets shows martensite, tempered martensite, bainite, pearlite colonies, and depth of etching vs. magnification. (M21, ST)

69-M. Short Circuit Etching of Copper. *Iron Age*, v. 165, Feb. 16, 1950, p. 99.

Based on article by M. Jaroszewicz-Bortnowski and J. Schoofs, **Engineers Digest.** See item 11-389, 1949. (M21, Cu)

70-M. MnSi and FeSi Determinations in Manganese Bronze. David M. Zall. *American Foundryman*, v. 17, Feb. 1950, p. 61-62.

Selective-solubility method for isolating inclusions in manganese bronze. X-ray diffraction patterns reveal the presence of FeSi and MnSi. (M22, Cu)

71-M. A Three-Stage Electron Microscope With Stereographic Dark Field, and Electron Diffraction Capabilities. M. E. Haine, R. S. Page, and R. G. Garfitt. *Journal of Applied Physics*, v. 21, Feb. 1950, p. 173-182.

Microscope in which magnifications between 1000 and 100,000 can be covered continuously. The instrument can be used to obtain electron-diffraction patterns characteristic of small areas of a specimen under microscopic observation. Some typical micrographs. (M21)

72-M. Comments on the Use of Latex Spheres as Size Standards in Electron Microscopy. Charles H. Gerould. *Journal of Applied Physics*, v. 21, Feb. 1950, p. 183-184.

Latex spheres have been distributed to about 225 laboratories in the U. S. and abroad. Seventeen of them have made average-particle-size determinations, using six different techniques. Results are tabulated and correlated. Effects of various factors on size and precautions in handling and storage. (M21)

73-M. Optical Micrography. (Concluded.) Jean Ternisien. *Microtecnic* (English Edition), v. 3, Nov.-Dec. 1949, p. 280-288. Translated from the French.

Metallurgical applications of the compound microscope; the polarized-light microscope and its applications; photomicrography; and motion-picture photomicrography. 25 ref. (M21)

74-M. The Atomic Arrangement of Amorphous Germanium. (In German.) Otto Fürst, Richard Glocker, and Hans Richter. *Zeitschrift für Naturforschung*, v. 4a, Oct. 1949, p. 540-542.

X-ray Fourier analysis reveals that the atoms of vapor-deposited amorphous Ge are differently arranged than in molten Ge. Diagram explains the relationship between the two arrangements. 15 ref. (M26, Ge)

75-M. A Graphic Method for Computing Structural Factors for X-Ray Analysis of Crystals. (In German.) Walter Hoppe and L. Camerer. *Zeitschrift für Naturforschung*, v. 4a, Nov. 1949, p. 637-639.

Description clarified by diagrams. (M26, M22)

76-M. The Vanadium-Nitrogen System. Metal Amides and Metal Nitrides. (In German.) Harry Hahn. *Zeitschrift für anorganische Chemie*, v. 258, Feb. 1949, p. 58-68.

Preparation, methods of analysis and properties. The nitrides have distinct physical properties and the thermal resistance of VN is extraordinarily high; N is not soluble in V. 20 ref. (M24, V, N)

77-M. Status of Carbides in Annealed Steel. (In Russian.) M. P. Arbuzov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Oct. 1949, p. 1119-1125.

Carbide powders separated from steel annealed at temperatures of 400-680° C. were studied by X-ray diffraction. It was concluded that carbide formed at 400° C. has a rhombic lattice with constants similar to those of the cementite lattice of annealed steel. (M26, ST)

78-M. (Book) Materials Testing With X-Rays. Ed. 3. (In German.) Richard Glocker. 440 pages. 1949. Springer-Verlag, Berlin, Göttingen, or Heidelberg, Germany.

While the new edition follows the same general plan as earlier ones, a new section has been added on noncrystalline materials and liquids. Also includes new equipment developed in recent years. The section on X-ray measurement of stresses in metals has been considerably expanded. An important section is a classification and description of the types of crystal structure. (M22)

N. TRANSFORMATIONS AND RESULTING STRUCTURES

26-N. Growing and Processing of Single Crystals of Magnetic Metals. J. G. Walker, H. J. Williams, and R. M. Bozorth. *Review of Scientific Instruments*, v. 20, Dec. 1949, p. 947-950.

Apparatus and procedure by which single crystals of Ni, Co, and various alloys are grown by slow cooling of the melt. Technique of orientation and grinding. (N12, SG-n)

27-N. Preparation of Single Crystal Copper Ribbons From Single Crystal Copper Rods. A. A. Petrauskas, E. A. Coomes, and J. E. MacDonald. *Review of Scientific Instruments*, v. 20, Dec. 1949, p. 961-962.

Technique developed in connection with work on electronic emission from single crystal surfaces. (N12, Cu)

28-N. A Technique for Cutting Metal Single Crystals. T. R. McGuire and Robert T. Webber. *Review of Scientific Instruments*, v. 20, Dec. 1949, p. 962-963.

Apparatus and technique in which the cutting action is due to suitable etching agent carried on a Fiberglas thread. (N12)

29-N. Rate of Self-Diffusion in Tin Crystals. W. Boas and P. J. Fensham. *Nature*, v. 164, Dec. 31, 1949, p. 1127-1128.

An explanation of the anisotropy in terms of the mechanism of diffusion does not yet seem possible. (N1, Sn)

30-N. Relief of Internal Stresses by Precipitation. L. M. Clarebrough. *Nature*, v. 165, Jan. 7, 1950, p. 39.

During an investigation of recrystallization of two-phase Ag-Mg alloys, it was observed that precipitation occurring in one of the phases, after deformation but before recrystallization, increases the temperature at which recrystallization starts in that phase. Experimental work was done on an Ag alloy containing 9.5% Mg. Includes back-reflection X-ray diagram and photomicrographs. Explains the effect in terms of dislocation theory. (N7, Ag)

31-N. The Breakdown of Austenite Below the M, Temperature. F. C. Thompson and M. D. Jepson. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 27-35.

Shows no reason to doubt that austenite in a plain carbon eutectoid steel can decompose isothermally below the M, temperature. Decomposition during the actual quenching operation and that due to isothermal transformation should be considered independently. Dilatometric investigations show that isothermal decomposition becomes progressively slower as the temperature is lowered, and that there is no sign of a knee in the curve. Nature of the transformation product. Maximum rate of breakdown may be related to temperature by an exponential equation. 14 ref. (N8)

32-N. The Overheating and Burning of Steel. Part III. The Influence of Excessive Reheating Temperatures on the Mechanical Properties and the Structure of Alloy Steels. A. Preece, J. Nutting, and A. Hartley. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 37-45.

Mechanical tests were used to follow changes induced in a range of alloy steels after treatment at temperatures up to 1425° C. Influence of cooling rate on development of the overheated condition. Statistical examination of the effect of steel composition indicates that carbon and sulfur are important constituents, but that the influence of oxygen is doubtful. A number of related problems, such as austenite grain growth and influence of overheating on isothermal decomposition of austenite were also investigated. (N8, Q general, AY)

33-N. Grain-Boundary Phenomena in Severely Heated Steel. T. Ko and D. Hanson. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 51-62.

Structure and tensile properties of carbon steels quench-hardened after being heated to very high temperatures in the austenitic range were studied. A new metallographic method of studying overheating was used.

The theory is proposed that overheating is due to partial precipitation on the austenite grain boundaries, at high temperatures, of sulfide brought into solution during heating. 17 ref. (N8, CN)

34-N. Structures of the Au_2Zn Phase in the Absence and in the Presence of Copper, Silver, and Cadmium. (In German.) Ernst Raub, Paul Walter, and Annemarie Engel. *Zeitschrift für Metallkunde*, v. 40, Nov. 1949, p. 401-405.

Results of X-ray studies of the alloy subjected to different heat treatments. Effects of Cu, Ag, and Cd on phase transformation were determined. (N9, Au)

35-N. Classification of Solubility of Elements in Iron. IV. Restricted Austenite Solid Solutions of Iron. (In Russian.) I. I. Kornilov. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR) (Section of Chemical Sciences), Sept.-Oct. 1949, p. 449-459.

On the basis of the relationship of atomic diameters of various elements and iron, the group of elements forming the modification of a restricted austenite solid solution with Fe is isolated. A system of ternary, quaternary, and more complex solid solutions is presented on this basis. The maximum number of possible systems is calculated. 10 ref. (N8, Fe)

36-N. Kinetics of the Eutectoid Transformation in Alloys of Iron and Nitrogen. B. N. Bose and M. F. Hawkes. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 307-316.

Metallographic, X-ray diffraction, and microhardness studies on an alloy of 2.35% N_2, balance Fe. This alloy is analogous to the eutectoid Fe-C alloy with respect to transformation to "pearlitic" and "martensitic" structures. Isothermal transformation at all temperatures is slower in the nitrogen alloy, and the austenite is far more stable with respect to transformation to martensite. 21 ref. (N8, Fe)

37-N. Interference of Growing Spherical Precipitate Particles. C. Wert and C. Zener. *Journal of Applied Physics*, v. 21, Jan. 1950, p. 5-8.

The exact theory of the rate of growth was previously developed for the initial stage where the individual precipitate particles do not interfere with one another. This theory is carried one stage further to include their mutual interference. Applicability of the theory was tested by observations on the precipitation of carbon from α-iron. (N7, Fe)

38-N. Particle Size of Evaporated Gold. P. G. Wilkinson and L. S. Birks. *Journal of Applied Physics*, v. 21, Jan. 1950, p. 60.

Shows that tungsten-free gold deposits in the form of discrete particles. (N15, Au)

39-N. Dependence of the Structure of the Condensate on the Number of Nuclei. (In German.) E. Traub. *Zeitschrift für angewandte Physik*, v. 1, Dec. 1949, p. 545-549.

Effect of "precondensation" on the structures of thin metal films vapor deposited on paper tape was investigated. The process described permits close control of the variables, such as rate of deposition, temperature, and vapor pressure. (N15)

40-N. Carbon-Beryllium Steels. *Metal Progress*, v. 57, Feb. 1950, p. 254-257. Condensed from paper by W. Aichholzer, *Berg- und Hüttenmännische Monatshefte*, v. 93, June 1948, p. 100-114.

Influence of Be on five different carbon steels was studied with respect to transformation temperatures, temperability, and resistance to scaling. (N8, R2, AY)

41-N. Strain Induced Grain Boundary Migration in High Purity Aluminum. Paul A. Beck and Philip R. Sperry. *Journal of Applied Physics*, v. 21, Feb. 1950, p. 150-152.

Method which allows positive determination of the direction of grain-boundary movements. Mechanism for migration based on use of the method. Most of the strain-free grains formed during annealing of high-purity Al cold rolled up to about 40% are produced by this mechanism without formation of new nuclei. (N3, Al)

42-N. Kinetics of Heterogeneous Nucleation. D. Turnbull. *Journal of Chemical Physics*, v. 18, Feb. 1950, p. 198-203.

A theory for the effect of thermal history upon the kinetics of phase transformations is proposed. The kinetics of heterogeneous nucleation in the absence of retained embryos. 18 ref. (N2)

43-N. Grain Boundary Diffusion of Molten Bismuth in Copper. (In German.) *Zeitschrift für Naturforschung*, v. 4a, Oct. 1949, p. 524-526.

Microscopically investigated. It was found that depth of penetration is a linear function of time, and that log of penetration rate is proportional to the reciprocal of absolute temperature. Above 700° C., copper oxide is reduced by the Bi. (N1, Bi, Cu)

44-N. Rapid Transformations in Aluminum Solid Solutions. (In German.) Hermann Auer. *Zeitschrift für Naturforschung*, v. 4a, Oct. 1949, p. 533-540.

Age-hardening processes are explained as the result of atomic re-

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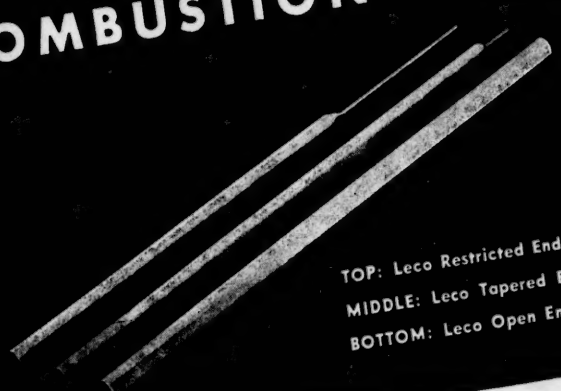

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arrangement in the crystal lattice. Effects of solution heat treatments and of extremely rapid heating show that rate of heating materially affects the structure of the metal, as shown by hardness and magnetic susceptibility curves. 20 ref.
(N7, Al)

45-N. Effect of Bainite Structure on the Mechanical Properties of a Heat Resistant Heat-Treated Cr-Mo Steel. (In German.) U. Wyss. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, Dec. 1949, p. 365-374.

See abstract of condensed version from *Metal Progress* (item 4B-60, 1949), and original in *Von Roll Mitteilungen*, (4B-48, 1949).
(N8, Q general, AY)

P

PHYSICAL PROPERTIES AND TEST METHODS

37-P. The Freezing Point of Uranium. Andrew I. Dahl and Harold E. Cleaves. *Journal of Research of the National Bureau of Standards*, v. 43, Dec. 1949, p. 513-517.

Previously abstracted from *U. S. Atomic Energy Commission*, AECD-2541, Mar. 22, 1949. See item 3C-112, 1949. (P12, U)

38-P. Ferromagnetic Materials. N. F. Astbury. *Sheet Metal Industries*, v. 27, Jan. 1950, p. 43-46.

Proceedings of symposium arranged by Institution of Electrical Engineers, Nov. 7-8, 1949, London.
(P16, SG-n, SG-p)

39-P. Emission of Infra-Red Radiation by Metallic Powders. H. A. Prime. *Research*, v. 3, Jan. 1950, p. 51-52.

Experiments were made using inorganic and metallic powders of various particle sizes to obtain preliminary information on distribution of the radiation wavelengths, effect of particle size on the radiation, and possibility of using this technique as a source of long wavelength radiation. Experimental technique and results for Cu powders. (P17, Cu)

40-P. New Copper-Base Alloys Combine High Strength With High Conductivity. Webster Hodge and Kenneth Rose. *Materials & Methods*, v. 31, Jan. 1950, p. 64-65.

Development of two series of alloys for wire conductor by Battelle Memorial Institute for U. S. Army Signal Corps. Electrical and mechanical properties suit them to uses where high breaking strength, minimum volume, and high current-carrying capacity are required. The two alloys contain 6½% Ag and 12½% Fe respectively. Heat treatment and wire-drawing procedures. (P15, T1, Cu)

41-P. Effect of Adsorbed Polar Organic Compounds on Activity of Steel in Acid Solution. Norman Hackerman and E. L. Cook. *Journal of the Electrochemical Society*, v. 97, Jan. 1950, p. 1-9.

A series of aliphatic acids, amines, and esters, and one commercial corrosion inhibitor, were adsorbed from benzene solution onto SAE 1020 steel powder. These studies showed that some portion of the sorbed material, depending on the compound, could not be desorbed by fresh solvent. Effect of the adsorbed material on the activity of the steel powder in aqueous HCl. Ratio of the activity to that of untreated steel powder was found to depend on compound adsorbed and on the type of adsorption. (P13, R5, CN)

42-P. The Theory of the Change in the Conductivity of Metals Produced by Cold Work. J. K. Mackenzie and E. H. Sondheimer. *Physical Review*, ser. 2, v. 77, Jan. 15, 1950, p. 264-270.

Attempts to calculate increase in residual electrical resistance of cold worked metals by attributing the effect to an elastic distortion similar to that produced by the presence of edge-type dislocations. Mean density of dislocations in a highly cold-worked polycrystalline specimen of copper is estimated from observed resistance change and is found to be in reasonable agreement with the value derived from energy stored during work hardening. (P15)

43-P. Optical Effects in Bulk Silicon and Germanium. H. B. Briggs. *Physical Review*, ser. 2, v. 77, Jan. 15, 1950, p. 287.

High transparency and high refractive indices make possible construction of unique optical elements for infrared use. These lenses are opaque to visible and ultraviolet light. (P17, Si, Ge)

44-P. Ferromagnetic Resonance Absorption by Mo Permalloy at 2920 Mc/Sec. Junkichi Itoh and Tetsuo Akioka. *Physical Review*, ser. 2, v. 77, Jan. 15, 1950, p. 293-294.
(P16, Ni, SG-n)

45-P. Some Physical Properties of Titanium. Herbert I. Fusfeld and Joseph T. Gilbert. *Physical Review*, ser. 2, v. 77, Jan. 15, 1950, p. 302-303.

Damping, sound velocity, density, and modulus of elasticity.
(P general, Q general, Ti)

46-P. The Rehbinder Effect. E. N. da C. Andrade and R. F. Y. Randall. *Nature*, v. 164, Dec. 31, 1949, p. 1127.

Rehbinder and colleagues have reported that surface-active liquids in contact with the surface of metals, in particular of single crystals, markedly diminish mechanical strength. However, Kemsley obtained negative results with single crystals of tin. Experiments seem to indicate that the Rehbinder effect is due to a disintegrating action of the agent on the oxide film, which in its original condition strengthens the crystal, and not to any deep penetration of the liquid as supposed by Rehbinder. (P13, Q23)

47-P. Experiments on the Superconductive Transition. D. K. C. MacDonald and K. Mendelssohn. *Proceedings of the Royal Society*, ser. A, v. 200, Dec. 22, 1949, p. 66-84.

Change of electrical resistivity at the transition between the superconductive and the normal state in a longitudinal magnetic field was investigated. Experimental procedure yields consistent and reproducible results on lead, mercury and tin. Under "ideal" conditions the transition is not discontinuous. 22 ref. (P15, Pb, Hg, Sn)

48-P. The Effect of Carbon on the Activity of Sulphur in Liquid Iron. J. P. Morris and R. C. Buehl. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 317-322.

A study was made of equilibrium conditions in the reaction between hydrogen gas and dilute solutions of S in liquid Fe-C alloys. Carbon content has a decided influence. Effect of temperature is small. (P12, Fe)

49-P. The Vapor Pressure and Thermodynamic Activities of Zinc in Solid Alpha Brasses. A. W. Herbenar, C. A. Siebert, and O. S. Duffendack. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 323-326.

Vapor pressures of Zn over solid alpha brasses were determined for six alloys containing 5-30% Zn by an absorption-spectra method. Activities and activity coefficients are given for Zn for the six alloys.
(P12, Zn, Cu)

50-P. The Thermo-Elastic Effect in Iron and Nickel as a Function of Temperature. Roberto Rocca and M. B. Bever. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 327-333.

Adiabatic thermo-elastic temperature change was determined as a function of temperature and stress in nickel and Armco iron. Results are in agreement with an equation first derived by Lord Kelvin. Near the Curie temperature, the thermo-elastic effect changes appreciably. 26 ref. (P11, Fe, Ni)

51-P. Thermodynamic Properties of Sulphur in Molten Iron-Sulphur Alloys. Charles W. Sherman, Hans I. Elvander, and John Chipman. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 334-340.

The equilibrium in the reaction: $H_2(g) + S = H_2S(g)$ was reinvestigated from 1530 to 1730° C. and S concentrations up to 4.8%. Free-energy change in the above reaction was established as a function of temperature. Values of the activity coefficient of S were determined. Effect of Si on the latter was computed. 11 ref. (P12, Fe)

52-P. The Manganese Equilibrium Under Simple Oxide Slags. John Chipman, John B. Gero, and Theodore B. Winkler. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 341-345.

New experimental data. Slags consist of the oxides of Fe and Mn with small amounts of impurities. The new data lead to values of K_{Mn} which are significantly higher than those of Korber and Oelsen and in general somewhat above those of other investigators. Thermodynamic calculation from published data at lower temperatures gives results which agree fairly well with experimental data. 15 ref. (P12, Fe, Mn)

53-P. Surface Impedance of Superconducting Tin, Mercury, and Lead at 9200 Mc/Sec. I. Simon. *Physical Review*, ser. 2, v. 77, Feb. 1, 1950, p. 384-387.

Surface resistance and change of surface reactance were measured. Results were evaluated in terms of the penetration depth λ of Londons' theory and limiting values of λ for $T = 0$ were obtained.
(P15, Sn, Hg, Pb)

54-P. Energy Bands and Mobilities in Monatomic Semiconductors. W. Shockley and J. Bardeen. *Physical Review*, ser. 2, v. 77, Feb. 1, 1950, p. 407-408.

Theoretical analysis and estimates for Si, Ge, and Te.
(P15, Si, Ge, Te)

55-P. Ultrasonic Measurements in Metallic Beryllium at Low Temperatures. W. C. Overton, Jr. *Journal of Chemical Physics*, v. 18, Jan. 1950, p. 113-115.

Velocity of longitudinal waves in metallic beryllium was measured from 300 to 23° K., and transverse waves from 300 to 3° K. Adiabatic moduli and compressibility were computed from the velocities. A new technique for affixing the quartz transducer to the solid for ultrasonic measurements, in suitable solids, below 100° K., was successfully employed. (P10, Be)

56-P. Heat Transport in Superconductors. K. Mendelssohn and J. L. Olsen. *Proceedings of the Physical Society*, v. 63, sec. A, Jan. 1, 1950, p. 2-13.

Heat-conduction processes in superconductors on the basis of analogy

with liquid helium II. The heat conductivity of a number of pure metals and alloys was measured in the normal and in the superconductive state and the results analyzed. In addition to change of heat conduction with temperature, magnetic hysteresis of heat conduction was investigated. 16 ref. (P11, Ta, Cb, Pb)

57-P. The Magnetization of Superconducting Plates in Transverse Magnetic Fields. E. R. Andrew and J. M. Lock. *Proceedings of the Physical Society*, v. 63, sec. A, Jan. 1, 1950, p. 13-25.

Magnetization curves of thin superconducting tin plates were measured in transverse magnetic fields. Resistance measurements on thin strips of tin in transverse fields showed that resistance only reappears for fields considerably greater than those required to start the destruction of superconductivity. (P16, P15, Sn)

58-P. Thermodynamics of Reactions in Molten Copper. R. W. Ruddle and A. Cibula. *Bulletin of the British Non-Ferrous Metals Research Association*, v. 29, Dec. 1949, p. 501-505.

Presents detailed criticisms of two recent papers by H. Lepp: "Thermodynamics and Metallurgy of Tin Bronzes", *Metal Treatment and Drop Forging*, v. 16, Summer 1949, p. 67-76; and "Thermodynamic Analysis of the Equilibrium Reaction $6Cu + SO_2 \rightleftarrows 2Cu_2O + Cu_2S$" (in French), *Revue de Métallurgie*, v. 46, Mar. 1949, p. 155-159. (P12, Cu)

59-P. Concerning the Solubility of Nitrogen in Iron Melts With Chromium, Manganese, and Nickel Additions. (In German.) Hanns Wentrup and Otto Reif. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 359-362.

Studied at 1600 and 1700° C. and at the melting points, for Cr, Mn, and Ni contents up to 20%. Results show that Cr and Mn increase the solubility of N_2, while Ni and rising temperatures reduce it. Data are graphed. 13 ref. (P12, Fe)

60-P. Determination of the Surface Tension of Molten Metals From the Shape of Stationary Droplets. (In German.) Gotthold Becker, Fritz Harder, and Heinz Kornfeld. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 363-367.

Determined for pig iron, electrolytic copper, and carbonyl iron under a high vacuum and under argon, respectively. 14 ref. (P10, Fe, Cu)

61-P. Relationship of Depth of Penetration of Magnetic Fields in Superconductors to Absorptive Power of the Metal. (In German.) F. Moglich and R. Rompe. *Annalen der Physik*, ser. 6, v. 4, no. 6, 1949, p. 335-351.

Shows a correlation between depth of penetration of magnetic fields in superconduction and the limiting wave length of absorption of the metal in the short-wave part of the visible range. The strength of absorption in this range varies inversely with thermal expansion coefficient of the metals. Experimental results are presented for Hg, Ag, and other superconductive metals. (P15, P16)

62-P. Reflection Measurements on Sanded Aluminum. (In German.) Joachim Euler. *Zeitschrift für angewandte Physik*, v. 1, Dec. 1949, p. 569-573.

Wave-length dependence of diffusive power of reflection and dispersion under different conditions of incidence and reflection were studied. Effects of grain size, different impurities, and mechanical damage on sanded or coarsely ground Al surfaces. 10 ref. (P17, Al)

63-P. Method of Studying Chemical Reactions Involving Liberation of Gases. (In Russian.) Yu. V. Baimakov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Nov. 1949, p. 1331-1333.

Method enables graphic evaluation of the course of the reaction over short time intervals. Method was applied to reduction of heavy-metal oxides, to reactions between sulfides and oxides of metals, to study of content of electrolytically obtained metals, and to reduction of oxides at high temperatures. Data confirm applicability of the method. (P13)

64-P. Changes of Superconductive Properties of Thallium Under Pressure. (In Russian.) L. S. Kan, B. G. Lazarev, and A. I. Sudovtsov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 11, 1949, p. 173-174.

Investigated under a pressure of 1730 kg. per sq. cm. at the temperature of liquid helium. (P15, Tl)

65-P. Magnetic Strength and Role of Displacement of Domain Boundaries During the Process of Magnetic Reversal in Highly Coercive Alloys. (In Russian.) N. Bulgakov and E. Kondorskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 21, 1949, p. 325-328.

Investigated for alloys containing 24% Ni, 12% Al, 1.5% Cu, rest Fe; and 13% Ni, 8% Al, 3% Ca, 24% Co, rest Fe; differently heat treated, the second one being cooled in a magnetic field. Magnetic strength was measured at different temperatures. (P16, SG-n)

66-P. Concerning Changes of Volume of Tin During the Superconductive Transition in a Magnetic Field. (In Russian.) B. G. Lazarev and A. I. Sudovtsev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 21, 1949, p. 345-347.

Results of experimental investigation. (P15, Sn)

67-P. The Constant of Magnetic Anisotropy of Highly Coercive Alloys. (In Russian.) N. V. Bulgakov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Dec. 1, 1949, p. 521-522.

The constant was determined for a single crystal of Alnico by means of a torsion dynamometer. The theoretical value agrees satisfactorily with the experimental one. (P16, SG-n)

68-P. The Rectangular Loop of Magnetic Hysteresis of Ferromagnetic Substances Deformed in the Range of Crystallization Temperatures. (In Russian.) M. V. Dekhtyar. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Dec. 1, 1949, p. 527-530.

By application of an external tensile stress during crystal formation, conditions may be created which will cause the hysteresis loop to assume a rectangular form. Experiments on carbon-steel wire (0.65% C) confirmed this theoretical assumption. 10 ref. (P16, CN)

69-P. Influence of Aging on the Curve of Temperature Versus Coercive Force in "Dynamo" Steel. (In Russian.) Ya. S. Shur and K. B. Vlasov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Dec. 1, 1949, p. 551-553.

Coercive force of steel containing 1% Si, quenched from 700-800° C., and subjected to artificial aging. (P16, AY, SG-p)

70-P. Temperature Dependence of Coercive Force in Highly Coercive Alloys. (In Russian.) N. V. Bulgakov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Dec. 11, 1949, p. 627-628.

Temperature dependence of coercive force and magnetic saturation in three highly coercive alloys: "Alni" (12% Al, 24% Ni, 1.5% Cu, rest Fe); "Alnico" (12% Co, 15% Ni, 8% Al, 1.5% Cu, rest Fe); and "Magnico" (24% Co, 12% Ni, 8% Al, 3% Cu, rest Fe), differently heat treated. (P16, SG-n)

71-P. Calculation of the Second Constant of Magnetic Anisotropy in the Law of Approach to Saturation. (In Russian.) L. V. Kirenskii and L. I. Slobodskoi. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Dec. 11, 1949, p. 639-642.

Improvement of the formula of Akulov for the above. The new formula is interpreted for different values of the variables. 12 ref. (P16)

72-P. Influence of Plastic Deformation on the Temperature Dependence of Coercive Force. (In Russian.) Ya. S. Shur and K. B. Vlasov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Dec. 11, 1949, p. 647-650.

Investigated for iron, "dynamo", and transformer steel; Ni; and Mo-permalloy specimens, differently heat treated. (P16, SG-n, SG-p)

73-P. High Temperature Calorimetry. I. A New Adiabatic Calorimeter. L. D. Armstrong. II. Atomic Heats of Chromium, Manganese, and Cobalt Between 0° and 800° C. L. D. Armstrong and H. Grayson-Smith. *Canadian Journal of Research*, v. 28, sec. A, Jan. 1950, p. 44-59.

Part I: A calorimeter having the advantage that specific heat at a definite temperature can be determined by a measurement taken over a small temperature interval, with a precision of 1% or better from 400 to 800° C. Part II: Results obtained using the apparatus. 23 ref. (P12, Cr, Mn, Co)

74-P. Metallic Valences. A. I. Snow. *Journal of Chemical Physics*, v. 18, Feb. 1950, p. 233.

Two different sets of valence now being applied to metals in alloys—those of Hume-Rothery and those of Pauling. (P10)

75-P. Sign Change of Magnetostriction Caused by Expansion. (In German.) Wilhelm Braunewell and Eckart Marburg. *Zeitschrift für Naturforschung*, v. 4a, Oct. 1949, p. 491-495.

Sign changes of magnetostriction of Heusler or Fe-Ni alloys are explained by spontaneous lattice distortion caused by tensile stresses, or by the fact that applied tensile forces "twist" the magnetization vectors away from the direction of "pull", despite positive magnetostriction. Effects of stresses and Ni contents of Fe-Ni alloys on magnetic properties. 10 ref. (P16, Fe, Ni)

76-P. Herzfeld's Metal Criterion and the Question of the Existence of a Non-Conducting Amorphous Modification of All Metals. (In German.) Herbert Mayer. *Zeitschrift für Naturforschung*, v. 4a, Oct. 1949, p. 527-533.

From the dispersion theory as a basis of the assumption that a metal is formed when the atoms of an element combine to form a liquid or solid, Herzfeld concluded that the molecular refractivity must be greater than the quotient of molecular weight, over density. This can be used to explain recent results on the electrical conductivity of metal foils. 22 ref. (P15, M26)

77-P. The Magnetization Curve of Nickel Under Tensile Stress. (In German.) Otto Buhl. *Zeitschrift für Naturforschung*, v. 40, Nov. 1949, p. 601-605.

Determined for a Ni wire under different tensile stresses. The magnetization curve of the unstressed metal is quite different from that of the stressed, but the amount of stress does not affect its shape. Effect of stress on magnetic susceptibility, coercive force, and demagnetization factor. Results are evaluated in the light of various theories on magnetism. (P16, Ni)

78-P. The Internal Magnetic Field of Ferromagnetic Materials. In German.) Werner Doring. *Zeitschrift für Naturforschung*, v. 40, Nov. 1949, p. 605-610.

Theoretical analysis. Effect of size of crystallites on permeability and coercive force, and several conclusions concerning the dispersion of ferromagnetic permeability. 30 ref. (P16)

79-P. Concerning the Solubility and the Behavior of Hydrogen in Molten and Solid Magnesium and Magnesium Alloys. (In German.) F. Sauerwald. *Zeitschrift für anorganische Chemie*, v. 258, Feb. 1949, p. 27-32.

Determined in Mg and two Mg alloys at 760° C. Effects of hydrogen on mechanical properties and microstructure. Methods of removing H_2 from the molten alloys by chlorination. (P12, Mg)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

79-Q. Properties of Through Hardened Steels. *Metal Progress*, v. 57, Jan. 1950, p. 80-B. From "Republic Alloy Steels", 1949 Edition.

Graphs show mechanical properties vs. heat treatment for a series of alloy steels.

(Q general, J general, AY)

80-Q. A New Boron Steel. Tom Bishop. *Metal Progress*, v. 57, Jan. 1950, p. 94, 96.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 3B-262, 1949. (Q23, AY)

81-Q. High-Temperature Fatigue Testing. *Metal Progress*, v. 57, Jan. 1950, p. 96, 98. Translated and condensed from "Method of Testing the Fatigue of Steel Samples at High Temperatures", M. F. Sichikov and Z. D. Vishnevetzkii, *Zavodskaya Laboratoria* (Factory Laboratory), Jan. 1948, p. 86-91.

Previously abstracted from condensed version in *Engineers Digest*. See item 9-108, 1949. (Q7, ST)

82-Q. A Reduction-of-Area Gage for Use at Low Temperatures. Glenn W. Geil and Nesbit L. Carwile. *Journal of Research of the National Bureau of Standards*, v. 43, Dec. 1949, p. 527-532; *ASTM Bulletin*, Jan. 1950, p. 75-78.

A gage for measuring change in diameter of cylindrical or notched tension specimens during tests at controlled temperatures from −196° to +100° C. Measurements can be made with an accuracy of 0.0001 in. Results obtainable are illustrated by true stress–true strain curves for annealed ingot iron, cold worked nickel and cold worked 18-8 Cr-Ni steel. (Q27, CI, SS, Ni)

83-Q. Precision Testing of Gas Turbine Disks. *Automotive Industries*, v. 102, Jan. 15, 1950, p. 40-41.

Apparatus designed for determination of plastic and creep strains at speeds up to 35,000 r.p.m., and temperatures up to 1500° F. (Q25, Q3)

84-Q. Fundamentals of the Working of Metals. Part VII. Combined Effects of Phase Changes and Forming Speeds. George Sachs. *Modern Industrial Press*, v. 12, Jan. 1950, p. 6, 8, 10. (Q23)

85-Q. A Note on the Notch Effect of Metals. K. Minamiozi and H. Okubo. *Journal of the Franklin Institute*, v. 249, Jan. 1950, p. 49-55.

Theory of elasticity shows that stress concentration around a diametrical hole of a round bar under tension increases as the diameter of the hole decreases, and when diameter of the hole decreases infinitely, stress-concentration factor approaches 3. On the other hand, fatigue tests show that strength of a bar with a very small diametrical hole does not differ perceptibly from that of a solid one. Classical theory was found insufficient to explain this phenomenon. Presents a new theoretical analysis and experimental results for mild steel, "special steel", and superduralumin. (Q25, ST, Al)

86-Q. Radiochromium Plating for Friction Studies. John T. Burwell and S. F. Murray. *Nucleonics*, v. 6, Jan. 1950, p. 34-37.

Application of radiochromium to piston rings for study of the phenomena of friction. (Q9, S19)

87-Q. Stress Distribution in Bridge Frames — Floorbeam Hangers. C. H. Sandberg, J. E. Bernhardt, S. C. Hollister, J. F. Marsh, F. M. Masters, N. M. Newmark, C. Earl Webb, and L. T. Wyly. *American Railway Engineering Association, Bulletin*, v. 51, Jan. 1950, p. 470-504.

Causes and remedies for the failures in floorbeam hangers in railway bridges. Fact-finding survey of failures which have occurred and the analysis of these failures; study of stress distribution in the hangers of selected bridges under service loads, both static and dynamic, and under service conditions, obtained by strain measurements in the field; and study of the stress distribution, under controlled laboratory conditions, in components and models of the hangers and of static and fatigue strength of these components. (Q25, T26, ST)

88-Q. Mechanism of Creep in Metals. G. R. Wilms. *Journal of the American Society of Naval Engineers*, v. 61, Nov. 1949, p. 892-907.

Previously abstracted from *Journal of the Institute of Metals*. See item 4A-60, 1949. (Q3)

89-Q. Investigation of a NACA High-Speed Strain-Gage Torquemeter. John J. Rebeske, Jr. *National Advisory Committee for Aeronautics*, Technical Note 2003, Jan. 1950, 41 pages.

The unit was designed, built, and operated over shaft speeds of 5000-17,000 r.p.m. and torque loads of 250-5500 in.-lb. Precision and accuracy were determined by static calibration and dynamic operation. Methods for overcoming effects of various operating variables. (Q25)

90-Q. Meyer Analysis of Metals. H. M. Finniston, E. R. W. Jones, and P. E. Madsen. *Nature*, v. 164, Dec. 31, 1949, p. 1128-1129.

Results of Meyer hardness analyses for uranium, tin, zinc, and gallium are tabulated along with literature data for common metals and alloys. (Q29)

91-Q. Hot Working; Desirable Qualities in Tool Steels. H. Carr. *Iron and Steel*, v. 23, Jan. 1950, p. 3-7.

Critical discussion of recent work on the influence of various elements on properties of hot work toolsteels. Recommends more work on effect of composition on hot-impact, hot-fatigue, hot-hardness, hot-tensile and hot-wear properties. 17 ref. (Q general, TS)

92-Q. Carbide Distribution as a Possible Cause of Temper Brittleness. L. D. Jaffe. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 1-3.

Difficulties of reconciling current theories of temper brittleness of steel with experimental data. A new hypothesis is suggested: that temper brittleness may arise from the effect of temperature, in the subcritical range, upon the quasi-equilibrium distribution of carbides or other phases. If the hypothesis is valid, the phase responsible for temper brittleness cannot be cementite. 24 ref. (Q23, ST)

93-Q. Tessellated Stresses. Part V. F. Laszlo. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 5-26.

Continues series of articles (Part IV published in 1945). The currently accepted theory of the influence of strains due to volume change on the shape of precipitates is carefully examined but rejected. Rules giving the true shaping effort of these strains, in terms of elastic constants and yield stress of matrix and precipitate, were determined. Conventional views on dislocation are extended by the idea that the atomic structure must become buckled. This leads to suggestions as regards the interpretation of hardness phenomena. 22 ref. (Q25, N7)

94-Q. X-Ray Investigations of the Behavior of Materials Under Alternating Stresses. (In German.) Alfred Schaal. *Zeitschrift für Metallkunde*, v. 40, Nov. 1949, p. 417-427.

Specimens of alloy steels and light metals previously annealed for stress relief were subjected to static and dynamic alternating stresses and the resulting surface stresses determined by an X-ray method. 27 ref. (Q25)

95-Q. A Statistical Representation of Fatigue Failures in Solids. (In English.) W. Weibull. *Acta Polytechnica* (Mechanical Engineering Series), v. 1, no. 9, 1949; *Transactions of the Royal Institute of Technology*, no. 27, 1949, 51 pages.

Statistical aspects, complete fatigue diagram, S-N curves, P-S curves, size effect, and computation of parameters. Numerical examples. 11 ref. (Q7)

96-Q. Mechanism of Plasticity of Homogeneous Metallic Alloys at High Temperatures. (In Russian.) K. A. Osipov. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR) (Section of Technical Sciences), Sept. 1949, p. 1372-1377.

Theoretical data and experimental investigation of binary and quaternary metallic alloys. A basic mechanism is strengthening the nonuniformity of distribution of the components, which may lead to formation of a new phase. (Q23)

97-Q. Effects of Three Interstitial Solutes (Nitrogen, Oxygen, and Carbon) on the Mechanical Properties of High-Purity Alpha Titanium. Walter L. Finlay and John A. Snyder. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 277-286.

Determined on fusion-alloyed, annealed specimens in comparison with a substitutional solute—iron. A good correlation between bend ductility as well as microtensile properties and Vickers hardness was established for both the binary and ternary alloys of the interstitial solutes. Shows that the element with the lowest solubility has the greatest strengthening effect. Relationship to associated lattice-parameter changes. 22 ref. (Q23, Q29, Ti)

98-Q. Some Effects of Phosphorus and Nitrogen on the Properties of Low Carbon Steel. G. H. Enzian. *Journal of*

Metals; Transactions of the American Institute of Mining and Metallurgical Engineers, v. 188, Feb. 1950, p. 346-353.

Simultaneous small variations show that the two elements have concomitant effects. Amounts of both elements present must be known to evaluate properly the significance of a change in either. 14 ref. (Q general, CN)

99-Q. The Effects of Molybdenum and Commercial Ranges of Phosphorus Upon the Toughness of Manganese Steels Containing 0.40 pct. Carbon. M. Baeyertz, W. F. Craig, Jr., and J. P. Sheehan. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 389-396.

Loss in toughness caused by P was studied in AISI-SAE 1340 steel and in molybdenum modifications of this grade. Replacement of part of the Mn by Mo in amounts which maintain hardenability was shown to counteract to a marked degree the detrimental effects. (Q23, AY)

100-Q. Studies in Fundamentals of Plasticity to Aid Design. D. C. Drucker. *Product Engineering*, v. 21, Feb. 1950, p. 128.

Fundamental research program at Brown Univ. sponsored by the U. S. Navy. (Q23)

101-Q. A Torsion Test for Enameled Steel. *Finish*, v. 7, Feb. 1950, p. 44-45, 58-59.

Test which shows good correlation with pre-shipment tests on packaged products and is effective for plant process control. Purpose is to indicate tendency toward enamel cracking as a result of strains commonly encountered during shipment. (Q1, ST)

102-Q. Energy Partition in Isothermal Fracture. Marguerite M. Rogers. *Journal of Applied Physics*, v. 21, Jan. 1950, p. 60-61.

Measurements were made of elastic potential energy and absorbed energy associated with the fracture of four notch specimens of a special Al-killed mild steel by observing, for several values of deformation, the fracture depth and applied dynamic load. Significance of energy partition in macro-fracture phenomena. (Q26, CN)

103-Q. The Yield Phenomena of a Medium Carbon Steel Under Dynamic Loading. F. V. Warnock and D. B. C. Taylor. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics), v. 161, War Emergency Proceedings No. 51, 1949, p. 165-175; discussion, p. 178-181.

Dynamic tensile tests made to determine the true shape of the stress-permanent-strain curve for rapid straining. Variation of this curve with change in strain rate and progressive deformation of the steel were also studied. Compares dynamic and static stress-strain curves, existence of a "dynamic upper yield stress" and a "dynamic lower yield stress" being shown. Effect of normalizing. A theory for the observed increases in stress. 14 ref. (Q27, CN)

104-Q. The Use of Plumber's Resin To Determine the Occurrence of Yield. J. S. Blair. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics), v. 161, War Emergency Proceedings No. 51, 1949, p. 176-177; discussion, p. 178-181.

Brittle lacquers used for determination of elastic stress have a number of disadvantages. Plumber's resin provides much the same information more readily and needs only a simple technique. It has the disadvantage that it is necessary to stress the specimen slightly beyond the yield point. Technique of application. (Q25)

105-Q. The Behaviour of a Nominally Isotropic 0.17 Per Cent Carbon Cast Steel Under Complex Stress Systems at Elevated Temperatures. A. E. Johnson. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics), v. 161, War Emergency Proceedings No. 51, 1949, p. 182-186.

See abstract of "Behavior of Cast Steel at Elevated Temperatures", *Engineer*, item 3B-173, 1949. (Q25, CN)

106-Q. Evaluation of the Stiffness Coefficients for Beryllium From Ultrasonic Measurements in Polycrystalline and Single Crystal Specimens. Louis Gold. *Physical Review*, ser. 2, v. 77, Feb. 1, 1950, p. 390-395.

Previously abstracted from *U. S. Atomic Energy Commission*, AECD-2644, July 21, 1949. See item 3C-230, 1949. (Q23, Be)

107-Q. Micro-Hardness Testing. E. C. W. Perryman. *Metal Industry*, v. 76, Jan. 13, 1950, p. 23-27.

An illustrated review of procedures and equipment. 20 ref. (Q29)

108-Q. Quality Control of Grey-Iron Castings. J. Leonard. *Foundry Trade Journal*, v. 88, Jan. 19, 1950, p. 71-74.

Extends earlier work on use of the Brinell test in the foundry by correlating results for hardness, tensile, and shear tests on the same irons. A knock-off testpiece of novel design has been developed for casting. (Q29, CI)

109-Q. Properties of Aluminum Alloys at Temperatures Close to That of the Solidus. (In French.) M. W. I. Pumphrey. *Fonderie*, Nov. 1949, p. 1807-1816.

Mechanical properties were investigated for pure Al and Al alloys with Cu, Si, and Fe near the solidus temperature. Tendency toward crack formation at temperatures above the solidus was determined for various concentrations of alloying elements. 12 ref. (Q general, N12, Al)

110-Q. The Effect of Weld Defects in Specimens of Steel St37 on Their Tensile Fatigue Strength. (In German.) Max Hempel and Hermann Möller. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 375-383.

Welds were tested in the longitudinal and transverse direction. Tensile fatigue strength depends on type, number, and size of defects. The fatigue strength of nondefective welds is usually 30-40% lower than that of similar nonwelded specimens. 13 ref. (Q7, K general, CN)

111-Q. Fracture Tendency and Surface Quality of Helical Springs. (In German.) Anton Pomp and Max Hempel. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 385-393.

Purpose of the research was to determine the effect of production conditions on properties of unalloyed and oil-tempered helical steel springs. Each operation in the production of the springs from the steel ingot to finished product was done by a different series of firms, and the finished springs were subjected to fatigue stresses up to a maximum of 10,000,000 cycles. Graphs, tables, and photographs show the results. 24 ref. (Q26, ST, SG-b)

112-Q. Determination of the Creep Strength of Ferrous and Nonferrous Metals. (In German.) Alfred Krisch. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 395-399.

Common methods for determining the high-temperature behavior of metals. The flow curve and the process of determining creep in long and short-time experiments. 70 ref. (Q3)

113-Q. Effect of Extrusion on Structure and Strength of Hardenable Aluminum Alloys. (In German.) H. J. Seemann. *Zeitschrift des vereines Deutscher Ingenieure*, v. 91, Dec. 1, 1949, p. 621-626.

Reviews the literature. Results for various alloys are tentatively classified, and the observed extension effect is explained on the basis of anisotropy due to low-temperature age hardening. Changes in strength properties caused by annealing at elevated temperatures are evaluated. 21 ref. (Q23, Al)

114-Q. Concerning Hardness. (In German.) Eugen Kappler. *Zeitschrift für angewandte Physik*, v. 1, Dec. 1949, p. 564-568.

Values obtained from cylinder-impression and ball-impression methods of hardness testing are not absolute, but depend on test conditions. Proposes a new definition of hardness, dependent only on the elasticity moduli of the material and of the indenter. (Q29)

115-Q. Embrittlement Phenomena in Heat Treated Steels with High Phosphorus. (In Swedish.) E. Houdremont and H. Schrader. *Jernkontorets Annaler*, v. 133, no. 10, 1949, p. 469-501.

Influence of high phosphorus contents on toughness of C and Cr-Ni steels in a hardened and tempered state was investigated. Embrittlement phenomena down to room temperature may be caused by carbide precipitation or by precipitation of phosphide. The extent to which so-called phosphorus embrittlement can be classed with temper embrittlement. 28 ref. (Q23, CN, AY)

116-Q. Relations Between Different Characteristics of Deformation. (In Russian.) V. G. Osipov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Nov. 1949, p. 1339-1342.

Determines relation between conditional relative elongation, conditional relative shear, conditional octahedral shear, true elongation, true shear, and true octahedral shear. Applications of these relations. (Q21)

117-Q. Technique of Plotting Diagrams of True Stresses. (In Russian.) K. K. Likharev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Nov. 1949, p. 1343-1347.

New method, taking into consideration the energy absorbed by structural parts of the test machine. (Q27)

118-Q. Plastic Bending. L. A. Shofman and P. I. Lokotosh. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Nov. 1949, p. 1348-1355.

Single calculation formula for determination of bending moment under both cold and hot plastic bending in the region of large deformations. Satisfactory agreement of experimental and calculated values establishes validity of the formula. Possibility of determining yield strength at high temperatures by bending tests. (Q23)

119-Q. Measurement of Sagging Due to Small Loads at the Moment of Structural Transformations in Steel. (In Russian.) N. E. Karskii and T. I. Sobolev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Nov. 1949, p. 1355-1358.

Apparatus indicates the increased rate of plastic deformation during austenite decomposition in the pearlite, bainite, and martensite regions and also during restoration, recrystallization, and processes taking place during annealing of quenched steel. (Q24, N8, ST)

120-Q. Deformation During Plastic Bending. (In Russian.) I. P. Renne. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Nov. 1949, p. 1359-1364.

Theoretically criticizes conclusions of Romanovskii showing that his formulas cannot be used for determination of minimum bending radius. (Q23)

121-Q. Influence of Test Conditions on the Effect of Adsorption in Facilitating the Deformation of Metallic

Monocrystals. (In Russian.) P. A. Rebinder and V. I. Likhtman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 11, 1949, p. 219-222.

Monocrystals of Pb, Zn, Sn, and Al were investigated. Mechanism of the effect of adsorbed surface-active agents on deformation. 10 ref. (Q24, P13, EG-a)

122-Q. Effect of 1150° F. Aging on Cr-Mo Steel Castings (2.5 to 9% Cr). N. A. Ziegler and W. L. Meinhart. *Metal Progress*, v. 57, Feb. 1950, p. 203-207.

Tables permit direct comparison of mechanical properties before and after treatment for a series of Cr-Mo steels. Metallographic studies of four 5% Cr steels, two being Ni-free and two containing 2% Ni, were also made before and after aging. (Q general, J27, CI, AY)

123-Q. Abrasion Resistance and Surface Energy of Solid Substances. W. v. Engelhardt. *Industrial Diamond Review*, new ser., v. 9, Dec. 1949, p. 366-369; v. 10, Jan. 1950, p. 19-23. Translated and condensed from *Naturwissenschaften*, v. 33, Oct. 15, 1946, p. 195-203.

Critical discussion of fundamental principles. Techniques for quantitative investigation. Commercial importance. 20 ref. (Q9)

124-Q. Metallographic and Physical Testing Equipment for Foundry Laboratories. *American Foundryman*, v. 17, Feb. 1950, p. 39-40.

List and brief description of necessary equipment. (E general)

125-Q. NACA Friction Studies of Lubrication at High Sliding Velocities. E. E. Bisson and R. L. Johnson. *Lubrication Engineering*, v. 6, Feb. 1950, p. 16-20.

Kinetic friction experiments were conducted on steel specimens with various lubricant films over a range of sliding velocities between 50 and 8000 ft. per min. and loads from 126,000 to 225,000 psi. 12 ref. (Q9, ST)

126-Q. Welding Metallurgy—Iron and Steel. Chapter 6. The Mechanical Properties of Metals. O. H. Henry, G. E. Claussen, and G. E. Linnert. *Welding Journal*, v. 29, Feb. 1950, p. 139-149.

Reprinted from book of same title. (Q general, Fe)

127-Q. Distribution of Relative Ductility in Steel Weldments. L. J. Klingler and L. J. Ebert. *Welding Journal*, v. 29, Feb. 1950, p. 59s-73s.

An investigation was made to determine dependence of zones of low ductility in weldments upon the steel and upon welding conditions and heat treatment. Ductility was evaluated by eccentric notch-bar tension tests conducted at various low temperatures. Occurrence of a zone of low-ductility is thought to be due to some subcritical temperature phenomena which may be the supersaturation and precipitation of carbon or carbides from the alpha phase. (Q23, CN)

128-Q. Effect of Fatigue on Transition Temperature of Steel. J. M. Lessells and H. E. Jacques. *Welding Journal*, v. 29, Feb. 1950, p. 74s-83s.

Tests were made on two shipbuilding steels. A combination fatigue-impact specimen was designed. It was round with a circumferential notch and could be tested in impact by sawing off the tapered ends necessary for holding in the fatigue machine. (Q7, CN)

129-Q. Further Study of Navy Tear Test. Noah A. Kahn and Emil A. Imbembo. *Welding Journal*, v. 29, Feb. 1950, p. 84s-96s.

Method for evaluating the susceptibility of steel plate to cleavage fracture. Application to evaluation of notch-sensitivity characteristics of medium and high-tensile ship-plate steels of current production and some special heats of medium steel. Influences of type of steel (process and chemistry), plate thickness, stress-relieving and normalizing, and microstructure. (Q26, CN, AY)

130-Q. Bending of an Ideal Plastic Metal. J. D. Lubahn and G. Sachs. *Transactions of the American Society of Mechanical Engineers*, v. 72, Feb. 1950, p. 201-208.

Stresses and strains in plastically bent parts are analyzed for a very wide plate (plane strain), and a very narrow bar (plane stress). The complete solution is presented for a hypothetical metal with no strain-hardening. Method of application to actual metals. (Q25)

131-Q. Results of Shear Fatigue Tests of Joints With 5/16-Inch-Diameter 24S-T31 Rivets in 0.064-Inch-Thick Alclad Sheet. Marshall Holt. *National Advisory Committee for Aeronautics*, Technical Note 2012, Feb. 1950, 45 pages.

Riveted joints were made in sheet of Alclad 24S-T3, 24S-T81, 24S-T36, 24S-T86, 75S-T6, 14S-T4, and 14S-T6. Design of the joint gives a wider range of fatigue strengths than does choice of material. (Q7, Al)

132-Q. System of the Relationships of the High-Melting Hexagonal Metals to Magnesium; High-Temperature Alloys Based on Mg-Th-Zr. (In German.) F. Sauerwald. *Zeitschrift für anorganische Chemie*, v. 258, May 1949, p. 296-306.

The alloyability of Be, Cr, Ti, Zr, Mo, Hf, W, Os, Th, and U with Mg was investigated. It was found that Y, Zr, Os, and Th can be readily combined with Mg. Mg-Th-Zr-Ce alloys are not only highly heat resistant but also have the highest known creep-stress resistance of all Mg-base alloys. 11 ref. (Q3, M24, SG-h, Mg)

133-Q. The Problem of the Effect of Surface Pressure on Fatigue Strength. (In German.) A. Eichinger. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 92, Jan. 11, 1950, p. 35-39.

Tests made to determine the effect of cold working on the strength properties of carbon steel machine parts show that results depend on a number of preliminary conditions, such as internal stresses, structure of the metals, shape of part, and type of stress. 24 ref. (Q7, CN)

134-Q. Concerning the Bases of the Theory of Strength and Plasticity. (In Russian.) G. V. Uzhik. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Oct. 1949, p. 1433-1455.

Analyzes modern theories. Application to solution of problems connected with determination of strength of materials. (Q23)

135-Q. Deformability of Copper-Zinc Alloys. (In Russian.) S. I. Gubkin and A. B. Simbirskii. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Oct. 1949, p. 1501-1511.

Influence of composition and temperature on mechanical properties and deformability of alloys containing 0.41% Zn. Diagrams are interpreted in terms of optimum temperatures and deforming forces. Value of a mechanical interpretation of constitution diagrams for more extensive development of the theory of alloys is demonstrated. (Q23, Cu)

136-Q. Application of the Method of Microhardness Determination to Solution of Certain Physical Problems. (In Russian.) B. S. Ioffe. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Oct. 1949, p. 1089-1102.

Different methods of microhardness determination by indentation. Dependence of microhardness on load applied. Results of investigation of properties of the thin surface layer of metal and of distribution of microhardness in the individual crystal grains are analyzed in the light of the theory proposed by Khrushov and Berkovich. 31 ref. (Q29)

137-Q. Residual Stresses Resulting From Simple Tensile Stress. (In Russian.) E. L. Assur, N. N. Davidenkov, and Yu. S. Terminasov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Oct. 1949, p. 1107-1118.

Results of experiments performed to verify the effect of Wood and Smith and consisting of measurement by mechanical and X-ray methods of residual stresses in surface layers of plastically deformed Al specimens. It was found that residual stresses exist only in this thin surface layer and are not a property of the atomic lattice itself, as was indicated by Wood and Smith. (Q25, Al)

138-Q. Strength of Materials. Bevis Brunel Low. 231 pages. 1949. Longmans, Green and Co., 55 Fifth Ave., New York 3, N. Y.

Elementary theory, giving clear and simple explanations with numerous worked examples. Each chapter includes problems. (Q23)

139-Q. (Book) **Werkstoffprüfung.** (Testing of Materials.) **Ed. 3.** F. Grahl. 80 pages. 1949. Carl Hanser Verlag, Munich, Germany.

Standard methods of hardness testing (no reference to microhardness testing); technological tests, particularly those for sheet metal. The spark test for grinding wheels is also mentioned. (Q general)

R

CORROSION

31-R. The Corrosion of Steel and Its Protective Metallic Coatings. Allan B. Dove. *Wire and Wire Products*, v. 25, Jan. 1950, p. 29, 31-37, 88-91.

Theory and practice. 34 ref. (R general, ST)

32-R. Caustic Soda Versus Construction Materials. *Chemical Engineering*, v. 57, Jan. 1950, p. 213-214, 216.

Part II of a symposium includes the following brief articles: "Rubber Linings", E. L. Lockman; "High-Silicon Iron", Walter A. Luce; "Stainless Steel", W. G. Renshaw; and "Cements", Raymond B. Seymour. Not recommended are: chemical stoneware (F. E. Herstein); aluminum (Ellis D. Verink, Jr.); and tantalum (Allan L. Percy). (R6)

33-R. The Electrochemical Behavior of Aluminum. I. In Solutions of Cerium Sulfate in Sulfuric Acid. J. V. Petrocelli. *Journal of the Electrochemical Society*, v. 97, Jan. 1950, p. 10-19.

Electrode potentials, weight-loss data, and polarization curves show that the reaction may be interpreted from an electrochemical point of view. The theory of "mixed potential" is suggested as a more generalized concept than the local cell idea for interpretation of the dissolution process. Probable mechanism for the dissolution and for the passive behavior of Al. 18 ref. (R1, Al)

34-R. Hydrogen Blistering Reported by Several Oil Companies. M. H. Barta and C. E. Rawlins. *Proceedings, American Petroleum Institute* (Refining Div.), v. 29M (III), 1949, p. 145-160; discussion, p. 160-162.

Previously abstracted from *Petroleum Processing*. See item 6B-124, 1949. (R2, T28)

35-R. Hydrogenation Plant Steels. George A. Nelson. *Proceedings, American Petroleum Institute* (Refining Div.), v. 29M (III), 1949, p. 163-172; discussion, p. 172-174.

Graphs show limits of stability for C and Cr-Mo steels for various combinations of temperature and pressure. Operating limits of these steels in contact with hydrogen. Cladding was ineffective because of diffusion of hydrogen unless escape holes were provided. Effects of S and NH_3. (R9, T29, CN, AY)

36-R. Corrosion and Stress Factors in Piping Expansion-Joint Failures. H. F. Brown and W. M. Goryl. *Proceedings, American Petroleum Institute* (Refining Div.), v. 29M (III), 1949, p. 175-183; discussion, p. 183.

Types of corrosion encountered in stainless steel bellows-type piping expansion joints used in fluid catalytic cracking units, and methods of alleviating these failures by reducing stress levels through improved design. Theoretical considerations and mathematical analysis show that a satisfactory joint can be manufactured using a stabilized stainless steel (type 347). (R1, T29, SS)

37-R. Cathodic Protection Within an Oil Refinery. Derk Holsteyn. *Proceedings, American Petroleum Institute* (Refining Div.), v. 29M (III), 1949, p. 184-193; discussion, p. 193-195.

Cathodic protection has proved practical and economical on the bare network of pipe lines and storage-tank bottoms in an oil refinery. The units are designed with the aid of graphs; current densities are based on laboratory investigations and experiences. (R10, T29)

38-R. Graphite Anodes for Cathodic Protection. W. W. Palmquist. *Petroleum Engineer*, v. 22, Jan. 1950, p. D22-D24.

Describes use, including practical calculations. (R10, C)

39-R. Cathodic Protection and Its Application to the Iraq Pipelines. W. C. R. Whalley. *Journal of the Institute of Petroleum*, v. 35, Oct. 1949, p. 705-734.

Fundamental principles and details of equipment and procedures. Includes pipe coatings and their application. 21 ref. (R10)

40-R. From a Metallurgist's Notebook: Corrosion of Brass. H. H. Symonds. *Metal Industry*, v. 76, Jan. 6, 1950, p. 3-4.

Staining and apparent corrosion of isolated spots and small areas of copper-clad stair rails was encountered after bronzing and lacquering. The cladding was found to be 95% Cu, 5% Zn. Causes and remedies were determined on the basis of visual and microscopic examination and abrasion testing. (R2, L22, Cu)

41-R. Observations on Corrosion of Ferrous Metals. George D. Lain. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 102-114.

Atmospheric, bacterial, chemical, high-temperature, soil, and underwater corrosion and stray current electrolysis. (R general, Fe)

42-R. Causes and Control of White Rusting on Zinc Coated Sheets. G. R. Hoover and Arba Thomas. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 243-251.

Three ways, other than keeping the sheets dry, by which white rusting can be delayed or reduced in intensity. (R10, Zn)

43-R. Neutralization as a Means of Controlling Corrosion of Refinery Equipment. E. Q. Camp and Cecil Phillips. *Corrosion*, v. 6, Feb. 1950, p. 39-44; discussion, p. 44-46.

Methods employed in injecting NaOH, NH_4, and lime. Detailed results on the use of NH_3 in controlling corrosion of equipment in connection with distillation, cracking, gas absorption, debutanization, and steam systems. 29 ref. (R10, T29)

44-R. Causes of Corrosion in Airplanes and Methods of Prevention. N. H. Simpson. *Corrosion*, v. 6, Feb. 1950, p. 51-57.

The various types of corrosion which may occur on present types of aircraft and the latest methods of combating them. Importance of continuous research into corrosion problems of supersonic aircraft and missiles. Some of the possible reactions that may occur at high speeds between the atmosphere and the aircraft or missiles' exposed surfaces. (R3, T24)

45-R. The Use of Ammonia in Control of Vapor Zone Corrosion of Storage Tanks. F. T. Gardner, A. T. Clothier, and F. Coryell. *Corrosion*, v. 6, Feb. 1950, p. 58-65.

Previously abstracted from *Oil and Gas Journal*. See item 6B-175, 1949. (R10, ST)

46-R. Electrolysis Experiences on 115 KV High Pressure Oil Filled Pipe Type Cable Installation in New Orleans. Sidney E. Trouard. *Corrosion*, v. 6, Feb. 1950, p. 66-71.

Electrolysis profiles and diagrams showing details of cathodic-protection set-up. (R10, CN)

47-R. Prevention of Corrosion by Means Other Than Protective Coatings. F. L. LaQue. *Corrosion*, v. 6, Feb. 1950, p. 72-78.

Reviews the literature in control of environments; cathodic protection; design; and adjustment of composition. 91 ref. (R10)

48-R. Corrosion in the Stratosphere. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 7A, 10A.

Numerous sources of corrosion of ferrous and nonferrous aircraft parts and surfaces. (R3, T24)

49-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 73A-74A.

Recent developments in copper and copper-base alloys for corrosion applications. (R general, Cu, SG-g)

50-R. Hydraulic Cylinder Varies Spring Load in Fatigue Tester. *Product Engineering*, v. 21, Feb. 1950, p. 102-103.

Seamless steel pipe for use in oil-well drilling operations can be subjected to simulated service conditions in new corrosion-fatigue tester. (R1)

51-R. Investigation of Purity of Aluminum-Silicon Die Casting Alloys. Donald L. Colwell. *ASTM Bulletin*, Jan. 1950, p. 51-53.

Summarizes work on outdoor-exposure, salt-spray, and salt-solution-immersion tests on 5 and 12% Si aluminum die-casting alloys made since 1934. The results indicate that commercial grades are as corrosion resistant as high-purity grades. Conclusions are based on mechanical properties after exposure as well as depth of attack, weight loss, etc. (R11, Al)

52-R. From a Metallurgist's Notebook: Stress Corrosion Cracking. H. H. Symonds. *Metal Industry*, v. 76, Jan. 13, 1950, p. 33.

Results of metallurgical examination of three small brass bobbin shields showing varying degrees of cracking. (R1, Cu)

53-R. Some Cases of Protection of Aluminum Alloys and Their Assemblies and Their Resistance to the Atmosphere and to Sea Water. (In French.) Nicolas Beliaeff. *Métaux & Corrosion*, v. 24, Oct. 1949, p. 239-245.

A series of tests on Al-Cu-Mg alloys, in the form of experimental specimens, and in the form of riveted and bolted structures. Different types of protective methods and agents. (R general, Al)

54-R. Resistance to Corrosion of Hard Chromium Deposits. (In French.) P. Marisset. *Métaux & Corrosion*, v. 24, Nov. 1949, p. 247-260.

Comparison of corrosion resistance in different media has value only if conditions of tests are identical. Results of tests in 160 different media under different conditions. 18 ref. (R general, Cr)

55-R. Resistance to Corrosion of Duralumin Subjected to Different Surface Treatments. (In French.) L. J. G. Van Ewijk. *Métaux & Corrosion*, v. 24, Nov. 1949, p. 261-273.

Resistance to different media of specimens of duralumin (3.7-4.7% Cu, 0.4-1.0% Mg, 0.1-0.7% Si, 0.3-0.7% Mn, remainder Al) and of duralumin coated with 99.5% Al, 99.99% Al, and MgMnAl was investigated. (R general, Al)

56-R. Scattering and Multiple Tests in the Study of Corrosion. (In French.) L. Cavallaro and A. Indelli. *Revue de Métallurgie*, v. 46, Nov. 1949, p. 758-761.

Suitability of accelerated laboratory tests, involving scientifically scattered data, for corrosion studies; as contrasted with the more reliable, but time-consuming multiple-test technique. 15 ref. (R11)

57-R. Stress Corrosion of Light Metals. (In Dutch.) A. Hartman. *Metalen*, v. 4, Oct. 1949, p. 21-27; Nov. 1949, p. 39-47; Dec. 1949, p. 59-65.

Discusses the principal theoretical and experimental investigations on Al and Mg alloys reported in the literature. Testing methods; influence of alloying elements and of heat treatment. Nov. issue: Effects of different corrosive media on structural factors such as notches, of temperature, of crystal structure, of type of stress, and of heat treatment. Concluding installment: Theory of stress corrosion and its application to specific types of Al alloys. 52 ref. (R1, Al, Mg)

58-R. Surface Reaction Between Aluminum and Mercuric Chloride. (In Italian.) G. Bolognesi. *Alluminio*, v. 18, Sept.-Oct. 1949, p. 493-497.

The attack on Al of various degrees of purity of $HgCl_2$ was investigated by electrochemical means. The influence of Hg and HCl concentration on the process. 16 ref. (R6, Al)

59-R. Concerning the Passivating Action of Halide Ions on Iron in Concentrated Acid Solutions. (In Russian.) Z. A. Iofa and L. A. Medvedeva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 11, 1949, p. 213-216.

The inhibitive effect on dissolution of iron in acid solutions caused by a series of inorganic inhibitors, particularly those containing halide ions, was investigated. Results indicate that this effect is caused by formation of a surface layer consisting of an iron-halide compound (probably monomolecular). (R10, Fe)

60-R. Corrosion of Metals Under Action of Hydrocarbon Solutions of Iodine. (In Russian.) L. G. Gindin and M. V. Pavlova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 21, 1949, p. 377-380.

Investigated for Cu, Pb, and Fe, using benzene and iso-octane solutions of iodine. (R5, Cu, Pb, Fe)

61-R. Rapid Determination of Susceptibility of Aluminum Alloys to Intercrystalline Corrosion. Hugh L. Logan. *Metal Progress*, v. 57, Feb. 1950, p. 211.

Technique requires only 30 min. or less. The specimen is made the anode in a normal NaCl solution. The

cathode may be another piece of sheet of suitable size. After 15-30 min. the specimen is mounted for microscopic examination. (R2, Al)

62-R. Caustic Soda Versus Construction Materials. *Chemical Engineering*, v. 57, Feb. 1950, p. 215-216, 218, 220, 222.

Part III of a symposium in which a representative group of construction materials is evaluated for services involving caustic soda. Consists of the following: "Carbon and Graphite", R. O. Joslyn; "Silicones", W. J. Hargreaves and Frances Henson; "Iron and Steel", Albert W. Spitz; "Protective Coatings", Kenneth Tator; "Nickel, Nickel Alloys", W. Z. Friend; and "Durimet", Walter A. Luce. (R6, Fe, Ni, SS, C)

63-R. Parabolic Oxidation Rates of Metals. Walter J. Moore. *Journal of Chemical Physics*, v. 18, Feb. 1950, p. 231.

Rate of growth of thickness of an adherent oxide film on a metal often follows a parabolic law. Mechanism involved on the basis of correlation of literature data on parabolic rate constants or oxidation of Al, Fe, Zr, Ti, Ni, Cu, Co, Zn, and Be. (R2)

64-R. Galvanic Corrosion—What It Is and How It Can Be Avoided. Samuel B. Ashkinazy and James M. Joyce. *Materials & Methods*, v. 31, Feb. 1950, p. 49-53. Reprinted from *Sperry Engineering Review*.

Essential principles and practical preventive measures. (R1)

65-R. Stress-Corrosion Cracking in Welded Steel Structures. C. E. Pearson and R. N. Parkins. *Welding Research*, v. 3 (bound with *Transactions of the Institute of Welding*, v. 12), Dec. 1949, p. 95r-106r.

Investigation of a failure in a welded mild steel gas main carrying saturated crude coke-oven gas at 35-40° C. Cracking in coke-oven gas and in a boiling solution of 60% $Ca(NO_3)_2$ + 3% NH_4NO_3 was found to be sufficiently related so that the latter could be used as a test method. Effects of various factors. (R1, CN)

66-R. Surface Preparation; New Studies on the Oxidation of Pure Aluminium. G. Chaudron and P. J. G. Lacombe. *Metal Industry*, v. 76, Jan. 27, 1950, p. 69-70.

It was verified that high-purity Al reaches a potential of −1.625 volts in electrolytes containing Hg salts, a value close to that obtained on electropolishing in the absence of oxygen. (R2, L19, Al)

67-R. Aerobic Microbiological Corrosion of Water Pipes. I and II. (In English.) Erik Olsen and Waclaw Szybalski. *Acta Chemica Scandinavica*, v. 3, no. 9, 1949, p. 1094-1116.

Proposes theory that iron bacteria play a prominent part in the phenomenon. Experiments made to test the theory. 33 ref. (R1, Fe)

68-R. Corrosion and Fouling. (In Russian.) N. I. Tarasov. *Priroda* (Nature), v. 38, Nov. 1949, p. 32-38.

Experimental investigation and literature data, particularly for ships and hydro-electric plants. Factors involved and methods of prevention. 26 ref. (R4)

S INSPECTION AND CONTROL

39-S. What You Should Know About Electrographic Testing. *Steel*, v. 126, Jan. 23, 1950, p. 56-60, 76.

Recent developments in electrographic methods for identifying metals, alloys, and inclusions, and for testing porosity in organic and metallic coatings. (S10, S15)

40-S. Identification of Metal Plate Deposits. *Materials & Methods*, v. 31, Jan. 1950, p. 83.

Presented in outline form. (S10, L17)

41-S. Examination of Surfaces; Permanent Records by Use of Negative Reproduction of Surfaces by Plastic Castings. John W. Sawyer. *Journal of the American Society of Naval Engineers*, v. 61, Nov. 1949, p. 819-827.

Techniques. (S15)

42-S. Radiography in the Steel Foundry. Richard M. Landis. *American Foundryman*, v. 17, Jan. 1950, p. 58-61.

An illustrated survey. (S13, CI)

43-S. New Methods for Determining Phosphorus in Steels. *Steel*, v. 126, Jan. 30, 1950, p. 46-49, 56, 59.

Spectrographic method using Geiger photo-electron tubes recently adopted for production control at Ford Motor Co. A single determination can be made in 2 min. Refinements in chemical techniques are also reported. 12 ref. (S11, ST, P)

44-S. Routine X-Ray Inspection Speeds Production of Large Welded Pressure Vessels. *Steel*, v. 126, Jan. 30, 1950, p. 59.

(S13, T26)

45-S. New Yardstick Accurately Gages Surface Finish. *Modern Industry*, v. 19, Jan. 15, 1950, p. 99-100.

Surface-finish standards made by General Motors from a gold-plated master. (S15)

46-S. Photo-Electric Exposure Meter for Industrial Radiography. D. T. R. Dighton and R. H. Herz. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, Dec. 1949, p. 404-407.

Meter using a multiplier photocell in conjunction with two different types of fluorescent screens. (S13)

47-S. Chromium and Manganese in Steel and Ferro-Alloys; Simultaneous Spectrophotometric Determination. James J. Lingane and Justin W. Collat. *Analytical Chemistry*, v. 22, Jan. 1950, p. 166-169.

The method of Silverthorn and Curtis was re-examined to determine whether the empirical calibration with standard steel samples is necessary. A study of the various optical and chemical factors demonstrates that Beer's law is obeyed and that Mn and Cr contents can be computed from the densities observed at two appropriately chosen wave lengths. Corrections are established for the effect of other elements commonly present in ferro-alloys. (S11, ST, Fe, Cr, Mn)

48-S. White Magnetic Fluid; A New Development in Magnetic Crack Detection. *Iron and Steel*, v. 23, Jan. 1950, p. 12.

(S13)

49-S. Split Thermocouples. A. Searby. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 36.

A method for continuous measurement of liquid-steel temperatures in which the thermocouple elements are led through the furnace lining into the metal at some distance apart, the molten charge thus completing the circuit and acting as the "hot junction". Despite certain advantages, laboratory investigation shows that use of Pt/Pt-13% Rh thermocouples without suitable protection from the molten metal is not practicable. (S16, ST)

50-S. A Wire-Drawing-Die Profilometer. R. M. J. Withers. *Journal of the Iron and Steel Institute*, v. 164, Jan. 1950, p. 63-66.

Instrument designed to measure and reproduce profiles of the bore of wire-drawing dies. It is intended for use with die bores with throat diameters of 0.02-0.25 in., and can also be used to measure bore diameter. Limit of measurement is 0.0001 in. (S15)

51-S. Bath Temperature Measurements. J. G. Mravec. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 172-182.

Importance of temperature control in melting of steel. History of bath pyrometry. Immersion blowing-tube pyrometers and thermocouples. (S16, D general)

52-S. Radioactive Isotopes as Tracers in Steel Industry Research. James P. Graham. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 264-277.

Methods of detecting and measuring nuclear radiation. Various metallurgical applications. Tracer study of sulfur during the coking of coal. 15 ref. (S19, ST)

53-S. Advances in Combustion Control in Pacific Coast Plants. R. S. Coulter. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 307-317.

(S16, ST)

54-S. The Practical Meaning of Mechanical Test Results. O. A. Klein. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 357-369.

Tests for predicting satisfactory service from samples of steel. Some possible changes in steel specifications. (S21, ST)

55-S. Inside Out. O. A. Battista. *Steelways*, v. 6, Jan. 1950, p. 24-26.

Use of X-rays for inspection of wide variety of materials and finished products. (S13)

56-S. High-Speed Reheating of Seamless Steel Tubes; Radiation Pyrometers Make Possible Successful Control of New High-Gradient Heating Process. H. W. Cox. *Instrumentation*, v. 4, 4th qtr. 1949, p. 3-6.

(S16, SS)

57-S. Design and Application of Thermocouples for Specific Needs. C. R. Bingham and C. C. Roberts. *Instrumentation*, v. 4, 4th qtr. 1949, p. 25-27.

(S16)

58-S. Tungsten-Iridium Thermocouple for Temperatures Above 2900° F. *Iron Age*, v. 165, Feb. 2, 1950, p. 92. Condensed from "The Tungsten-Iridium Thermocouple for Very High Temperatures", Walter C. Troy and Gary Steven.

Previously abstracted from *American Society for Metals*, Preprint No. 19, 1949. See item 13-58, 1949. (S16, SG-a)

59-S. The Tin-Fusion Method for the Determination of Hydrogen in Steel. Dennis J. Carney, John Chipman, and N. J. Grant. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 397-403.

Improved system developed solely for hydrogen analysis. Routine 15-min. analyses are standard. Precision of ±0.1 ppm. for a 2 g. sample is attained. 14 ref. (S11, ST)

60-S. The Sampling and Analysis of Liquid Steel for Hydrogen. Dennis J. Carney, John Chipman, and N. J. Grant. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Feb. 1950, p. 404-413.

An absolute calibration for sampling and analyzing liquid steel for hydrogen based on Sievert's values of solubility in iron. Further checks were made in Ni, Fe-Ni, and 18-8 stainless melts. The sampling method was successfully applied to a large

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number of commercial steel melts in various types of furnaces. 30 ref. (S11, ST)

61-S. An Optical Pyrometer Employing an Image-Converter Tube for Use Over the Temperature Range 350°-700° C. C. R. Barber and E. C. Pyatt. *Journal of Scientific Instruments*, v. 27, Jan. 1950, p. 4-6. (S16)

62-S. A New Heat-Flow Meter. H. Stafford Hatfield and F. J. Wilkins. *Journal of Scientific Instruments*, v. 27, Jan. 1950, p. 1-3.

Meter consists of a small disk of Te-Ag alloy with Cu gauze coating on its two sides. This is placed with its plane at right angles to the flow of heat to be measured, creating a small proportionate difference of temperature between the two sides. The disk is connected by fine wires through a terminal block to a galvanometer which registers the thermal e.m.f. due to difference in temperature of the two Te-Cu junctions. (S16)

63-S. Many New and Revised Standards on Steel, Nickel Alloys, Non-Ferrous Metals, Cast Iron, Rubber Products and Test Methods. *ASTM Bulletin*, Jan. 1950, p. 14-17.

Summarizes actions of ASTM Standards Committee at Dec. 1949 meeting. (S22)

64-S. Operating Principles of Various Temperature Measuring Devices. *Product Engineering*, v. 21, Feb. 1950, p. 138-139.

Presented in outline form with schematic diagrams. (S16)

65-S. Applications of Statistical Methods in Metallurgy. (In French.) Georges Darmois. *Revue de Métallurgie*, v. 46, Nov. 1949, p. 713-715.

Importance of statistics in metallurgy as a method for qualitative and quantitative determination of metal properties. A typical determination using statistics combined with theory of probability. (S12)

66-S. Application of Methods of Statistical Control in Spectrographic Analysis. (In French.) Robert Girschig. *Revue de Métallurgie*, v. 46, Nov. 1949, p. 719-726.

Usefulness of the above on an industrial and laboratory scale. (S11, S12)

67-S. Statistical Representation in Form of Diagrams of the Results of Mechanical Tests on Drawn or Rolled Light Alloys. Importance of These Diagrams for the Producer and Consumer. (In French.) M. Renouard. *Revue de Métallurgie*, v. 46, Nov. 1949, p. 727-734.

Technique and method of utilization of the obtained diagrams. (S12, Q general, Al)

68-S. Application of Statistics in Heavy Industry. (In French.) A. W. Swan. *Revue de Métallurgie*, v. 46, Nov. 1949, p. 735-754.

Theoretical bases of the methods, technique of application, and typical results obtained on application to some problems in steelmaking and primary fabrication. (S12)

69-S. Application of Spectroscopic Analysis to Al-Zn-Mg Alloys (Ergol). (In Italian.) T. Nuciari. *Alluminio*, v. 18, Sept.-Oct. 1949, p. 476-480.

Conditions for determination of Zn, Mg, Cu, Fe, Si, Mn, Cr, and Ti. Results are compared with those obtained by chemical analysis. (S11, Al)

70-S. Ultrasonic Defect Detector for the Non-Destructive Testing of Materials. (In German.) Herbert Krautkrämer, Josef Krautkrämer, and Otto Rüdiger. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 355-358.

Instrument that records graphically even small defects in different types of metal. Examples of possible uses. 10 ref. (S13)

71-S. Immersion Thermocouple in French Steel Plant. R. J. Castro. *Metal Progress*, v. 57, Feb. 1950, p. 210.

Technique of use of Pt/Pt-Rh couple. (S 16)

72-S. Thermocouples of the Refractory Metals. F. Haydn Morgan and W. E. Danforth. *Journal of Applied Physics*, v. 21, Feb. 1950, p. 112-113.

Thermo-electric power of several refractory thermocouples was investigated: W-Ta up to 3000° C., W-Mo up to 2600° C., Ta-Mo up to 2600° C., and W-W/Mo (alloy 50% Mo/50% W) up to 2900° C. Basic calibration was carried out using several melting points and results were verified and interpolated by means of an optical pyrometer. The W-Ta and W-Mo couples were applied to temperature measurement in high-temperature vacuum furnaces and to determinations of spectral emissivity. (S16, EG-d)

73-S. Neutron Spectroscopy for Chemical Analysis. II. Resonance Effects, Transmission in the 1/v Region. W. W. Havens, Jr., and T. I. Taylor. *Nucleonics*, v. 6, Feb. 1950, p. 66-77.

Examples illustrate application and limitations of the methods described. 12 ref. (S11)

74-S. Evaluating Casting Finishes. H. H. Fairfield and James MacConachie. *American Foundryman*, v. 17, Feb. 1950, p. 47-48.

Inspection and test methods. Set of surface-finish specimens made by precision casting. (S15)

75-S. Standards and the Tool Engineer. L. B. Bellamy. *Tool Engineer*, v. 24, Feb. 1950, p. 24-25.

Various standardization activities of ASTE. (S22)

76-S. Flux Densities for Magnetic Particle Inspection. T. E. Hamill. *Welding Journal*, v. 29, Feb. 1950, p. 105-114; discussion, p. 114-115.

Method for determining the flux density of steels magnetized with direct current. Practical application to a tube section shows the relation between flux density vs. depth values and current required to locate artificial defects at various depths below surface, when magnetized by direct and indirect methods. (S13, ST)

77-S. A New Method for Surface-Temperature Measurement. Nobuji Saski. *Review of Scientific Instruments*, v. 21, Jan. 1950, p. 1-3.

The method makes use of a thermocouple whose measuring junction can be adjusted to any temperature. The temperature of the junction indicated by a millivoltmeter in the couple circuit is also the temperature of the surface, if the junction temperature is adjusted for no deflection upon light, brief contact with the surface. (S16)

78-S. A Temperature-Controlled Resistance Furnace for High Temperature Measurements. W. G. Schneider and N. R. S. Hollies. *Review of Scientific Instruments*, v. 21, Jan. 1950, p. 94-95.

Furnace and control system designed to maintain a platinum gas pipet at a uniform temperature to within 0.05° C. over a working temperature range from 600 to 1200° C. (S16)

79-S. Alloy Steel Castings; The Need for Further Standard Specifications. R. T. Rolfe. *Iron and Steel*, v. 23, Feb. 1950, p. 49-50.

British viewpoint. (S22, AY, CI)

80-S. Analysis by Nuclear Transformation. (In German.) Wolfgang Riezler. *Zeitschrift für Naturforschung*, v. 4a, Oct. 1949, p. 545-549.

Since the half-life of induced radioactivity in metals is proportional to the relative quantity of the constituents in a given metal, irradiation of the metal with neutrons or rapid deuterons permits a nondestructive method of quantitative analysis. The method is especially sensitive in the analysis of Al for Si and Na, the degree of accuracy being as high as ±0.001%. (S11, Al)

81-S. Comparison of the Variable-Density and Line-Width Processes of Quantitative Spectrochemical Analysis. (In German.) Walter Rollmagen and Hildegard Weltz. *Zeitschrift für Naturforschung*, v. 40, Nov. 1949, p. 570-573.

The line-width process is preferable when one of the lines shows a strong "self-reversal"; but in all other cases, it is superior only when the characteristics of the photographic plate cannot be closely controlled. (S11)

82-S. Detection of Surface Films by Means of Electron Interference. (In German.) Heinz Raether. *Zeitschrift für Naturforschung*, v. 40, Nov. 1949, p. 582-587.

Experiments with Zn and Al were made to show that the possibility of detecting surface films—and of measuring their thicknesses with a fair degree of accuracy—depends upon the surface smoothness of the metals. 23 ref. (S15, Zn, Al)

83-S. Chromatographic Extraction and Radiographic Identification of Platinum Metals. (In German.) Georg-Maria Schwab and Amelendra Narayan Ghosh. *Zeitschrift für anorganische Chemie*, v. 258, May 1949, p. 323-331.

Investigated on an Al_2O_3 column. The extraction of Ir, Pt, Pd, and Rh, which are adsorbed in this order, was radiographically determined by measuring the lattice constants of the extracted metals, confirming the results indicated by the colors of the various zones in the column. The method is suited to separation of Pt metals from other metals (exception Fe). 11 ref. (S11, EG-c)

84-S. (Book) **Handbook of Industrial Radiology. Ed. 2. 1949.** J. A. Crowther, editor. Edward Arnold Co., London. 21s.

Incorporates many revisions and additions to first edition, published five years ago. No new information is forthcoming concerning the use of new sources of gamma radiation in radiography although mention is made of the probability of such sources becoming available. A table of absorption coefficients is added as an appendix. (S13)

85-S. (Book) **Cross Index of Bar Stock Specifications. 1949.** National Screw Machine Products Assn., 13210 Shaker Square, Cleveland 20, Ohio. $1.00.

A correlation of bar stock specification numbers of the following groups: Society of Automotive Engineers; Army & Navy Aeronautical Specification; Army; National Emergency; Federal; American Iron & Steel Institute; Aeronautics Div. of the Society of Automotive Engineers; Navy; and American Society for Testing Materials. (S22)

T

APPLICATIONS OF METALS IN EQUIPMENT

44-T. Torque Converter Produced With Stamped Steel Parts. R. C. Zeidler. *Automotive Industries*, v. 102, Jan. 15, 1950, p. 44-45, 114, 116.

Converter made by Detroit Gear Div. for Studebaker's automatic transmission. (T21, ST)

45-T. Magnesium in Navy Planes.

J. E. Sullivan. *Aero Digest*, v. 60, Jan. 1950, p. 78, 80, 91, 93.
Previously abstracted from *Magazine of Magnesium*. See item 25D-27, 1949. (T24, Mg)

46-T. Design and Development Considerations of Bimetallic Brake Drum. Charles E. Stevens, Jr. *SAE Quarterly Transactions*, v. 4, Jan. 1950, p. 24-37; discussion, p. 37.
Previously abstracted from condensed version in *SAE Journal*. See item 24A-153, 1949. (T21)

47-T. Housing: Steel Breaks Record but Misses Jackpot. D. I. Brown. *Iron Age*, v. 165, Jan. 26, 1950, p. 61-68.
Uses of steel in residential building. Statistical data and forecast of future prospects. (T26, A4, CN)

48-T. Castings Can Do It Better! Bruce L. Simpson. *American Foundryman*, v. 17, Jan. 1950, p. 34-36.
Several cases in which castings replaced parts fabricated by other methods, resulting in cost savings and other advantages.
(T general, E general)

49-T. TV: Big Light Metals Consumer. *Modern Metals*, v. 5, Jan. 1950, p. 15.
Some applications of Al and alloys in television. (T1, Al)

50-T. Magnesium Printing Plates Cut Photo-Engraving Costs. *Modern Metals*, v. 5, Jan. 1950, p. 28.
(T9, Mg)

51-T. Corrosion Resisting Steels. I. Qualitative Review of Grades for Chemical Industry. II. Sources of Attack and Comparative Resistance. J. A. McWilliam. *Chemical Age*, v. 61, Dec. 3, 1949, p. 769-771; v. 62, Jan. 7, 1950, p. 15-18.
Part II includes tables showing quantitative weight losses of various steels resulting from attack by common acids. (T29, R5, SG-g)

52-T. Are Pressure Vessels Too Thick? Benjamin Miller. *Chemical Engineering*, v. 57, Jan. 1950, p. 95-98.
Arguments to show that conventional design codes require much excess wall thickness over that needed for reasonable safety. Based on fundamental principles of yield strength and metallurgical structure. Fifty natural-gas containers have been operated at 2240 psi. for three years without trouble, although their safe maximum operating pressure under the most liberal interpretation of the rules is 950 psi. (T26, Q23, ST)

53-T. Materials at Work. *Materials & Methods*, v. 31, Jan. 1950, p. 66-67.
Al roof for storage tanks; low-melting alloy and phenolic-resin matchplates; Mg safety blocks for metal-forming presses; square steel tubing; steel pressure chamber for testing submarine equipment; and polyethylene package.
(T general, Al, Mg, ST)

54-T. Steel Weldments Modify Crane Fabrication, Lower Production Costs. Dan Reebel. *Steel*, v. 126, Jan. 30, 1950, p. 50-52.
Use of weldments results in lighter, better-looking crane components together with attendant production savings. For some specific parts, a combination of weldments and castings produces the best product at the most reasonable cost.
(T5, K general, CN)

55-T. An Interesting Conversion. *Light Metals*, v. 13, Jan. 1950, p. 24-25.
Application of Al to doors of wood-drying kilns. (T29, Al)

56-T. On a New Housing Estate. *Light Metals*, v. 13, Jan. 1950, p. 26-29.
Unique applications of Al in a British housing project. (T26, Al)

57-T. Light Alloy at the Building Exhibition, Olympia, 1949. *Light Metals*, v. 13, Jan. 1950, p. 38-55.
Varied applications of Al at British "show". (T26, Al)

58-T. Titanium Alloys for Aircraft. Nathaniel F. Silsbee. *Journal of the American Society of Naval Engineers*, v. 61, Nov. 1949, p. 908-913.
Reprinted from *Aero Digest*. See item 23D-53, 1949. (T24, Ti)

59-T. Heat Resistant Alloys for Aviation. F. S. Boericke. *Journal of the American Society of Naval Engineers*, v. 61, Nov. 1949, p. 952-957.
Previously abstracted from *Aero Digest*. See item 23A-22, 1949.
(T24, SG-h)

60-T. Development of an Insert Rock Bit. John B. Baker. *Mining Congress Journal*, v. 36, Jan. 1950, p. 38-41, 57.
Research, laboratory, and field testing. Problems solved include materials selection, design, and brazing. Various carbides were tested for wear. (T28, SG-j)

61-T. Metallurgical Developments and the Mining Engineer. L. Sanderson. *Canadian Mining Journal*, v. 71, Jan. 1950, p. 70-72.
Materials and processes used to make the tools and equipment used by the mining engineer. (T28)

62-T. Large Pressure-Forgings. Their Significance for Military Aircraft; Existing and Proposed Manufacturing Facilities in the United States. K. B. Wolfe. *Aircraft Production*, v. 12, Jan. 1950, p. 23-26.
(T24, F22)

63-T. Modern Wing Structures; The Importance of Tapered Sheet and Large Pressure-Forgings. S. Joseph Pipitone. *Aircraft Production*, v. 12, Jan. 1950, p. 27-32.
(T24, F22)

64-T. The Great Joiner. Harold L. Flynn. *Steelways*, v. 6, Jan. 1950, p. 20-23.
Fabrication and applications of nails. (T7, CN)

65-T. Forced Convection Ovens in Process Engineering. N. R. Maleady. *Industrial Heating*, v. 17, Jan. 1950, p. 105-106, 108, 110, 112, 114-115.
General recommendations for design, operation, and applications.
(T5)

66-T. High Temperature Applications of Ceramic Materials in Gas Turbines. *Industrial Heating*, v. 17, Jan. 1950, p. 124, 126. Based on paper by Winston H. Duckworth and I. E. Campbell.
Possibilities of gas turbines with higher operating temperatures, longer life, and lower weight. Ceramic stator blades, ceramic-coated parts, and metal-ceramic combinations are being investigated. The vapor-deposition coating process seems most promising. (T25, L25)

67-T. The Use of Corrosion-Resistant Alloy Steels in the Heavy Chemical Industry. F. H. Keating. *Nickel Bulletin*, v. 22, Dec. 1949, p. 186-190.
(T29, AY, SS, SG-g)

68-T. Sintered Metallic Friction Materials Have Many Automotive Applications. Clyde S. Batchelor. *Automotive Industries*, v. 102, Feb. 1, 1950, p. 36-37, 78.
Uses and description of sintering procedure. (T21, H15)

69-T. Drilling for Oil With Large Precision Castings. K. J. Yonker and J. F. Henderson. *Iron Age*, v. 165, Feb. 2, 1950, p. 75-78.
New well-drilling method which uses 8 and 12-lb. precision castings as rotor and stator to drive cutting bits. Technique permits use of lower quality drill pipe. (T28, AY)

70-T. An Alternate to Lead Sheath for Telephone Cables. Anthony Paone. *Corrosion*, v. 6, Feb. 1950, p. 46-50; discussion, p. 50.
In new type of sheath moisture protection is provided by a combination of corrugated aluminum, moisture-resistant cement, and an outer poly-ethylene jacket. The new cable offers possibilities as an alternative to lead-sheath cable with corrosion protection for use in conduit. (T1, Al)

71-T. Zirconium Arc Lamp. *Electronics*, v. 23, Feb. 1950, p. 184, 186, 188.
New high-intensity electric arc light one-eighth as bright as the sun. The light source, which operates in the open air and not in a glass bulb, is a pool of molten zirconium metal which is maintained at a temperature near 6500° F.
(T10, Zr)

72-T. Carbide Tool Design for Freedom From Brazing Stress. Malcolm F. Judkins. *Tool & Die Journal*, v. 15, Jan. 1950, p. 54-56, 102.
(To be continued.) (T6, K8)

73-T. Better Mold Liners for Dry Pressing Brick. Roy D. Haworth. *Iron Age*, v. 165, Feb. 9, 1950, p. 79-83.
Results of field and laboratory abrasion tests of steels for mold-liner use. Cast vs. rolled comparisons. High-C, high-Cr, and a modified high-speed steel were found to be the best materials. (T5, Q9, AY)

74-T. Light Overhead. *Die Castings*, v. 8, Feb. 1950, p. 19-20.
Uses of Cr-plated Zn die castings in light fixtures. (T10, Zn)

75-T. Magnetic Insert for New Type Latch. *Die Castings*, v. 8, Feb. 1950, p. 21.
Cupboard latch operating by means of a permanent magnet embedded in a Zn die casting, and a steel plate on the door. (T6, Zn)

76-T. Gears and Impellors. *Die Castings*, v. 8, Feb. 1950, p. 22-24.
A few miscellaneous examples made of die-cast Zn, Al, Mg, Sn, and Cu.
(T7, EG-a)

77-T. Latch On to Lower Costs. *Die Castings*, v. 8, Feb. 1950, p. 27, 60-61.
Die-cast Zn hardware and fittings for house trailers. (T6, Zn)

78-T. Sound-Damping in Business Machines With Magnesium Die Castings. *Die Castings*, v. 8, Feb. 1950, p. 28-30.
Use of die-cast Mg alloys in the LaSalle Stenotype machine.
(T10, Mg)

79-T. Tire Gauge Calls for Section Variation. *Die Castings*, v. 8, Feb. 1950, p. 33-34.
Combination tire inflator and gage with Al-alloy die-cast body used in garages and service stations.
(T10, Al)

80-T. Vending Machines Show Versatility of Zinc Die Castings. *Die Castings*, v. 8, Feb. 1950, p. 36-38, 61-62.
Miscellaneous applications.
(T10, Zn)

81-T. High-Temperature Fans Employ Unique Design Features To Obviate the Unbalancing Effects of Expansion. Herbert Chase. *Machine Design*, v. 22, Feb. 1950, p. 119-121.
New line of stainless-steel centrifugal fans that operate successfully and continuously at temperatures as high as 1800° F. (T10, SS)

82-T. Aluminum, Stainless, Plastics Combined in Precision Device. *Product Engineering*, v. 21, Feb. 1950, p. 95.
Device for measuring standing-wave ratio, impedance, and wavelength in the 60-2000-megacycle range used in development and adjustment of antennas, transmission lines, and associated equipment.
(T1, Al, SS)

83-T. Cemented Carbides Used for Non-Cutting Applications. J. S. Gillespie. *Machinery* (American), v. 56, Feb. 1950, p. 184-185.
Various applications to machine parts where special characteristics are required. (T7, SG-j)

84-T. Production of Custom-Built Neon Signs and Architectural Panels. W. A. Barrows. *Finish*, v. 7, Feb. 1950, p. 23-26.

Operations include welding, forming, press operations, pickling, finishing, and enameling. (T26)

85-T. Basic Problems in the Engineering of a Modern All-Metal Motor Body. E. S. White. *Institution of Mechanical Engineers, Proceedings* (Automobile Div.), Part I, 1948-49, p. 10-15.

The range of materials (steels and Al alloys) from which a body may be made; and the relative merits of different forms of construction in the light of quantity production. An example of the way in which multiple pressing operations can be facilitated by careful sequence planning. A section on corrosion prevention is included. (T21, ST, Al)

86-T. Steel Castings in Machine Design. *Machinery* (London), v. 76, Jan. 12, 1950, p. 56-57.

Applications in heavy units required for use in rolling mills and associated finishing departments. (T5, CI)

87-T. The Design and Performance of Plain Bearings. Philip T. Holligan. *Engineering*, v. 169, Jan. 6, 1950, p. 9; Jan. 13, 1950, p. 55-56. A condensation.

Discusses advantages and disadvantages of the various bearing alloys and of different design arrangements. (T7, SG-c)

88-T. Technical Flow Principles of Industrial Furnaces. (In German.) Michael Hansen. *Archiv für das Eisenhüttenwesen*, v. 20, Nov.-Dec. 1949, p. 337-344.

The basic laws of heat flow. Wall and free turbulence. Value of use of scale models in furnace design. (T5)

89-T. The Aluminum Roof on the "S. Maria della Spina" Church in Pisa. (In Italian.) Gian Carlo Nuti. *Alluminio*, v. 18, Sept.-Oct. 1949, p. 481-492.

Roof installed following serious war damage. Includes description of chemical decorative and protective coating. 11 ref. (T26, Al)

90-T. Metal-Oxide Parts for Turbine Blades. *Metal Progress*, v. 57, Feb. 1950, p. 259, 261. Condensed from *Industrial Bulletin* (Arthur D. Little, Inc.), Nov. 1949.

Present status of such blades for high-temperature uses such as jet engines, gas turbines, etc. (T25, SG-h)

91-T. Aluminum Milk Bottle Cases Slash Costs of Refrigeration and Handling. Fred L. Church. *Modern Metals*, v. 6, Feb. 1950, p. 14-15. (T29, Al)

92-T. Bridge Repair; A Vast New Field for Aluminum. *Modern Metals*, v. 6, Feb. 1950, p. 26.

Outlines potentialities. (T26, Al)

93-T. Magnesium Dockboard: Safe—Strong—Light. *Modern Metals*, v. 6, Feb. 1950, p. 32-33.

Fabrication of dockboard for materials handling by welding and heat treatment; and advantages. (T5, Mg)

94-T. Catching the Dungeness. *INCO Magazine*, v. 23, Winter 1950, p. 10-11.

Use of Monel crab traps for avoidance of corrosion. (T10, Ni)

95-T. 305,800 Miles Without Firebox Trouble. *INCO Magazine*, v. 23, Winter 1950, p. 12.

Tests made to determine the relative value of Lukens Ni-Clad steel and carbon steel for firebox side sheets, and the performance of Monel staybolts as compared with the conventional type. (T23, Ni)

96-T. Postponing That Last Long Mile. *INCO Magazine*, v. 23, Winter 1950, p. 14, 25.

Use of Al alloy pistons with Ni-Resist ring inserts in truck engines for reduced wear. (T21, Al, CI)

97-T. Six Times the Life for Exhaust Pipes. *INCO Magazine*, v. 23, Winter 1950, p. 15-16.

Use of Inconel in truck exhaust pipes. (T21, Ni)

98-T. Refinery Flare Tip Saves $13,200. *INCO Magazine*, v. 23, Winter 1950, p. 16.

Use of Inconel avoids necessity for frequent replacement. (T29, Ni)

99-T. Anchoring a Ceramic Building Façade. *INCO Magazine*, v. 23, Winter 1950, p. 19, 29.

Use of Monel tie wire. (T26, Ni)

100-T. Steel Castings: Structural and Production Advantages; Specification Requirements for Aircraft Purposes. *Aircraft Production*, v. 12, Feb. 1950, p. 64-65.

(T24, CI)

101-T. Magnesium Wall Forms. *Light Metals*, v. 13, Feb. 1950, p. 80-83.

Advantages for the production of concrete foundations. (T26, Mg)

102-T. Evolution of Welded Box Car Design. *Mechanical and Electrical Engineer*, v. 124, Feb. 1950, p. 66-70. Condensed from report by L. E. Grant. (T23, K general)

103-T. What Constitutes Good Glasshouse Irons. Kenneth McGrath, D. P. Forbes, and F. W. Dixon. *Glass Industry*, v. 31, Feb. 1950, p. 81-83, 106.

Desirable properties of cast irons used for molds in the glass factory. (T29, CI)

104-T. Materials at Work. *Materials & Methods*, v. 31, Feb. 1950, p. 68-70.

Steel die blocks, light-alloy motor grader, carbide scrapers, armored Al truck, stainless-steel heat exchanger, and several applications of nonmetals. (T general)

105-T. Record Loads in Aluminum Box Car. *Railway Age*, v. 128, Feb. 11, 1950, p. 46-48.

Details of boxcar built for Canadian railroad and believed to be the first ever constructed with an all-aluminum body including the underframe. Weight savings result in large increase in loading capacity. (T23, Al)

106-T. Investigation of Failures in Railroad Rails. R. E. Cramer. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 543-550.

Appendix 2-a of Report of A.R.E.A. Committee 4 on Rail. Details of examination of control-cooled rails which failed in service on various railroads; results of preliminary tests on rails with welded bond wires (torch and thermit welded). (T23, S21)

107-T. Rail Failure Statistics. Ray McBrian, C. J. Code, C. B. Bronson, G. F. Hand, J. G. Roney, and A. A. Shillander. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 550-566.

Report on Assignment 3 from Report of A.R.E.A. Committee 4 on Rail. Extensive statistics on failures reported up to Dec. 31, 1948, are tabulated and charted. (T23, S21)

108-T. Continuous Welded Rail. I. H. Schram, C. H. Blackman, T. A. Blair, B. Bristow, B. Chappell, C. J. Code, P. O. Ferris, H. S. Loeffler, R. F. Loga, R. R. Manion, Ray McBrian, E. H. McGovern, B. R. Meyers, R. J. Middleton, E. E. Oviatt, J. C. Ryan, A. P. Talbot, H. F. Whitmore, and R. P. Winton. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 569-570.

Report on Assignment 6 from Report of A.R.E.A. Committee 4 on Rail. New installations, processes used, and failures. (T23, K general)

109-T. Service Tests of Various Types of Joint Bars. T. A. Blair, J. B. Akers, H. B. Barry, W. J. Burton, E. E. Chapman, C. M. Chumley, C. J. Code, P. O. Ferris, R. L. Groover, S. R. Hursh, L. R. Lamport, E. E. Mayo, Ray McBrian, E. H. McGovern, R. A. Morrison, Embert Osland, R. E. Patterson, W. C. Perkins, J. C. Ryan, and W. D. Simpson. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 570-584.

Report on Assignment 7 from Report of A.R.E.A. Committee 4 on Rail. 1948 service-test installations and dynamic stress results obtained under various traffic conditions, indicating suitability of new designs. (T23, S21)

110-T. Eighth Progress Report of the Rolling Load Tests of Joint Bars. R. S. Jensen. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 585-593.

Appendix 8-a to Report of A.R.E.A. Committee 4 on Rail. Tests made at University of Illinois during past year. Hardness and rolling-load test data. Macrographs and micrographs of failed bar sections. (T23, S21)

111-T. Rail Fractures Resulting From Engine Wheel Burns, Including Effect of Repairing Such Burns by Oxyacetylene or Electric Welding. J. B. Akers, J. E. Armstrong, H. B. Barry, C. H. Blackman, C. M. Chumley, H. R. Clarke, C. J. Code, L. S. Crane, C. B. Harveson, S. R. Hursh, H. S. Loeffler, R. F. Logan, Ray McBrian, L. T. Nuckols, E. E. Oviatt, W. C. Perkins, G. A. Phillips, J. G. Roney, E. F. Salisbury, F. S. Schwinn, A. A. Shillander, G. L. Smith, A. P. Talbot, R. P. Winton, and J. E. Yewell. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 594-595.

Report on Assignment 9 of A.R.E.A. Committee 4 on Rail. Brief progress report includes tabulation of rolling-load test results. (T23, K1, K2, S21)

112-T. Causes of Shelly Spots and Head Checks in Rail; Methods for Their Prevention. L. S. Crane, C. H. Blackman, T. A. Blair, B. Bristow, C. B. Bronson, E. E. Chapman, C. J. Code, P. O. Ferris, J. L. Gressitt, G. F. Hand, C. B. Harveson, L. R. Lamport, C. C. Lathey, E. E. Mayo, Ray McBrian, E. H. McGovern, R. J. Middleton, L. T. Nuckols, Embert Osland, W. C. Perkins, G. A. Phillips, J. G. Roney, I. H. Schram, A. A. Shillander, G. L. Smith, Barton Wheelwright, R. P. Winton, and J. E. Yewell. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 595-597.

Report on Assignment 10 of Report of A.R.E.A. Committee 4 on Rail. Research progress to date in connection with field tests by various railroads. (T23, S21)

113-T. Eighth Progress Report of the Shelly Rail Studies at the University of Illinois. R. E. Cramer. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 597-607.

Appendix 10-a to Report of A.R.E.A. Committee 4 on Rail. Results of examinations of shelly rails from service and of laboratory tests designed to produce shelling. Results indicate that the laboratory tests are a quick method for determining probable service life. Tests were made on standard carbon-steel and alloy-steel rails. (T23, S21, CN, AY)

114-T. Summary Report on the Examination of Rails Which Contain Detail Fractures to Joint Contact Committee on Rails of Association of American Railroads and American Iron and Steel Institute and Committee on Rail of American Railway Engineering Association. J. E. Campbell, H. O. McIntire, and G. K. Manning. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 608-620.

Appendix 10-b of Report of A.R.E.A.

Committee 4 on Rail. Results of examination of 54 detail fractures found in service. Correlation of results with chemistry, mechanical properties, and structure was attempted. (T23, S21)

115-T. Recent Developments Affecting Rail Section. C. J. Code, J. E. Armstrong, T. A. Blair, C. B. Bronson, W. J. Burton, E. E. Chapman, H. R. Clarke, L. S. Crane, P. O. Ferris, G. F. Hand, S. R. Hursh, C. C. Lathey, H. S. Loeffler, R. R. Manion, Ray McBrian, B. R. Myers, R. J. Middleton, R. A. Morrison, W. C. Perkins, G. A. Phillips, F. S. Schwinn, and G. L. Smith. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 620-625.

Report on Assignment 11 of Report of A.R.E.A. Committee 4 on Rail. Results with respect to fatigue and stresses, also corrosion. (T23, S21)

116-T. Measurements of Stresses in 132 RE Rail on Tangent Track—Santa Fe Railway. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 626-640.

Appendix 11-a to Report of A.R.E.A. Committee 4 on Rail. Stresses were extensively determined. Results are correlated with fatigue-test data. (T23, Q7)

117-T. Fatigue Tests of Rail Webs. R. S. Jensen. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 640-647.

Appendix 11-b to Report of A.R.E.A. Committee 4 on Rail. Laboratory test data and their evaluation as a part of a continuing research program. Corrosion-fatigue data in tap water of two types. (T23, R1)

118-T. Service Tests on Crossings. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p. 653-660.

Appendix 4-a to Report of A.R.E.A. Committee 5 on Track. Results of service tests on several installations of Mn steel railroad crossings. (T23, S21, AY)

119-T. Prevention of Damage Resulting From Brine Drippings on Track and Structures. W. E. Cornell, F. J. Bishop, M. C. Bitner, Blair Blowers, E. W. Caruthers, P. H. Croft, M. H. Dick, C. T. Jackson, H. F. Kimball, E. R. Murphy, C. E. Peterson, and C. E. Price. *American Railway Engineering Association, Bulletin*, v. 51, Feb. 1950, p 661-663.

Report on Assignment 5 of Report of A.R.E.A. Committee 5 on Track. Results of laboratory and track tests in which various inhibitors were added to the brine solutions used in refrigerator cars to minimize corrosion. Sodium hexametaphosphate, and possibly disodium phosphate, give promise as nontoxic inhibitors. Use of other inhibitors poses serious toxicity problems. (T23, R10)

120-T. Aluminium Aids Television. *Metal Industry*, v. 76, Jan. 27, 1950, p. 71-73.

Use in parabolic reflectors used at relay stations. (T1, Al)

121-T. Results of Danish Experiments on Packing of Food in Aluminum Cans. (In French.) Bramsnaes. *Revue de l'Aluminium*, v. 26, Dec. 1949, p. 404-407. Condensed from *Revue Belge des Fermentations et des Industries Alimentaires.*

Tests carried out by the Danish Ministry of Fisheries indicate that aluminum is as good as tin plate and sometimes even better. Products take no metallic taste and do not blacken. The longest periods of preservation were obtained with anodized aluminum cans; or better, anodized and varnished cans. (T29, Al)

122-T. Aluminum Busbars. (In French.) *Revue de l'Aluminium*, v. 26, Dec. 1949, p. 408-412.

Practical data on the operation of aluminum busbars. Preparation of contact surfaces, welded or bolted joints, distribution of bolting pressure, expansion joints, and Al-Cu assemblies. (T1, Al)

123-T. High-Temperature Laboratory Furnace. (In Russian.) D. B. Ginzburg and A. T. Gelman. *Ogneupory* (Refractories), v. 14, Oct. 1949, p. 465-466.

Furnace incorporates air preheating and low-pressure oil burners. Temperatures up to 1760° C. may be obtained. Design details and specific characteristics. (T5)

124-T. (Book) Punches and Dies. Ed. 4. F. A. Stanley. 583 pages. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. $4.75.

Practical fundamentals, layouts, construction, and various uses for specific work. Development of die design, use of metal stampings for complicated constructions where expensive forgings or castings were formerly used, sectional dies, and big press work is included. (T5, G1)

125-T. (Book) Materials Engineering of Metal Products. Norman E. Woldman. 583 pages. 1949. Reinhold Publishing Corp., 330 W. 42nd St., New York.

Materials for light-weight construction, mechanical products, the electrical industry, and for special and severe service. Advantages and disadvantages of various metals and alloys in specific service applications. Includes tabular data on physical properties and performance statistics, and illustrations showing various types of metal failures. Chapter bibliographies. (T general, S21)

V

MATERIALS Not Classified In Other Sections

18-V. Forging and Welding Titanium. L. B. Frazier. *Iron Age*, v. 165, Jan. 19, 1950, p. 63-67.

Research and development work on ductile titanium conducted at GE Thomson Laboratory. Forging and welding, including inert-arc and resistance welding. Typical welder constants and some notes on the metallography of titanium. (Ti)

19-V. Use of Boron Steel in Production. Fred J. Robbins and J. J. Lawless. *Metal Progress*, v. 57, Jan. 1950, p. 81-89.

Previously abstracted from condensed version in *Iron Age*. See item 21B-40, 1949. (AY)

20-V. Developments of Germanium and Gallium During 1949. John R. Musgrave. *Journal of the Electrochemical Society*, v. 97, Jan. 1950, p. 8C.

New application developments. (Ge, Ga)

21-V. ZK61—A High-Strength Magnesium Casting Alloy. J. W. Meier. *Modern Metals*, v. 5, Jan. 1950, p. 26-28.

See abstract from *Light Metals*, item 1-V, 1950. (Mg)

22-V. Progress in Stainless Steel. *Canadian Metals*, v. 13, Jan. 1950, p. 44. Based on talk by Ernest Thum. (SS)

23-V. Developments in Alloy Steels. T. H. Arnold and C. V. Mills. *Metallurgia*, v. 41, Dec. 1949, p. 75-78.

Some development aspects concerned with steels for high-temperature service, resistance to corrosion, and to wear. (AY. SG-g. SG-h. SG-m)

24-V. Aluminium in 1949. E. D. Iliff. *Metallurgia*, v. 41, Dec. 1949, p. 79-83.

Technical and application developments. (Al)

25-V. Progress in High Duty and Alloy Cast Iron. A. B. Everest. *Metallurgia*, v. 41, Dec. 1949, p. 84-88.

Technological developments of 1949. (CI)

26-V. Some Recent Developments in Magnesium Alloys. R. G. Wilkinson. *Metallurgia*, v. 41, Dec. 1949, p. 91-95.

Alloys based on the Mg-Li system; the Zr-containing casting alloys; and Mg-alloy anodes for galvanic protection of iron and steel. Mechanical and physical properties and applications. (Mg)

27-V. Copper and Copper Alloys; Technical Progress in 1949. E. Voce. *Metallurgia*, v. 41, Dec. 1949, p. 96-101.

Review of papers presented and published during 1949. Prospecting and ore reserves, smelting and refining, melting and casting, fabrication, finishing and plating, and properties. 72 ref. (To be continued.) (Cu)

28-V. Production of Steel Castings. Charles W. Briggs. *Steel*, v. 126, Jan. 30, 1950, p. 60, 62, 64, 66, 68, 70; Feb. 6, 1950, p. 90-92, 94, 96, 99-100.

Part I: History, applications, and steelmaking methods. Concluding part: Molding operations, cores and their preparation, mold inspection and pouring, finishing operations, heat treatment, and inspection. (CI)

29-V. High Strength Steels. C. L. Altenburger. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 278-292.

Corrosion resistance, welding, forming, drawing, mechanical properties, and design possibilities. (AY)

30-V. Characteristics and Applications of Capped and Rimmed Steels. H. H. Smith. *American Iron and Steel Institute*, "Technical Committee Activities", 1949, p. 293-301.

Production methods, pertinent characteristics, fabrication methods, and a few applications. (ST)

31-V. Physical Properties of Ductile Zirconium. *Iron Age*, v. 165, Feb. 2, 1950, p. 88. Condensed from "Fabrication and Mechanical Properties of Ductile Zirconium", E. T. Hayes, E. D. Dilling, and A. H. Roberson.

Previously abstracted from *American Society for Metals*, Preprint No. 32, 1949. See item 3C-190, 1949. (Zr)

32-V. Potential Uses of Titanium Metal. O. C. Ralston and F. J. Cservenyak. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 214-218.

Uses of titanium as disclosed by the literature and reported by those who are actually testing its suitability for numerous purposes. The field of usefulness by the Army, Navy, and Air Force. Production is too costly to compete with steel, aluminum, and copper where these cheaper metals can function satisfactorily. 30 ref. (Ti)

33-V. Titanium Alloys. Bruce W. Gonser. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 222-226.

Fundamental and practical considerations limiting the range of obtainable Ti alloys. Among the most useful alloys are combinations of metal additions, particularly those having considerable solid solubility in either of the allotropic forms of Ti, plus small amounts of C, O_2, or N_2. (Ti)

34-V. Fabrication of Titanium-Rich Alloys; Mechanical Properties of Some Wrought Alloys. E. E Larsen, E. F Swazy, L. S. Busch, and R. H. Freyer. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 237-242.

Melting procedure and furnace used

EMPLOYMENT SERVICE BUREAU

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METALLURGICAL ENGINEER: Thirty years experience in the automotive ndustry. Thoroughly familiar with heat treatment of automotiv steels, writing material specifications and process standards. Wide acquaintance among automotive metallurgists Desire position as chief metallurgist or material engineer or contact metallurgist where experience and knowledge will be valuable Box 3-45

SUPERINTENDENT OF QUALITY CONTROL AND INSPECTION: Metallurgical engineer, business management. Age 32. Experienced in light and heavy industries including large machine shops and foundries, ferrous and nonferrous, mass producing and multiplant operations, installation of statistical quality control. Good contact man and supervisor. Looking for advancement. Present and past employer references. Minimum salary $7500. Box 3-50.

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FURNACE ENGINEER: Eight years in charge of machinery development and furnace work for production furnaces. Previously partner in firm manufacturing furnaces of batch and continuous types. Experience in engineering design and sales of metal stampings and machined parts. Box 3-65.

METALLURGIST: Twenty years comprehensive background in ferrous, nonferrous and stainless steels Resistance welding, supervision of heat treatment, quality control and the economics of materials and their usage. Desires position of responsibility in a plant where common sense and experience will be desirable. Location unimportant. Box 3-70.

CONSULTING METALLURGIST: Specialist in cyanide, salt bath metal treating and descaling. Services available April 1. Box 3-75.

METALLURGICAL ENGINEER: B.S in metallurgical engineering June 1949 Age 26; married; one child. Past work experience includes five years in welding of mild and stainless steel, and pipe, some sales and customer contact work. Interested in production development or sales. Desires position in Cleveland area with progressive company. Box 3-80.

METALLURGICAL ENGINEER: Twelve years of diversified professional and supervisory experience in industry — plant, laboratory and engineering staff. College graduate. Desires position along similar or related lines. Excellent speaker and writer. Single, will travel extensively. Location immaterial. Box 3-85.

METALLURGICAL ENGINEER: Graduate, Rensselaer Polytechnic Institute. 1946 Veteran; family. One year in steel plant: two years as assistant metallurgist of machine tool manufacturer with heat treating responsibility. Desires position with a Cleveland concern doing production work. Box 3-90

REGISTERED METALLURGICAL ENGINEER: B.S. in chemical engineering Three years' work toward M.S in metallurgy. Age 32; married; two children. Experience: Six years metallurgist in alloy steel, stainless and tool steel production — quality control, testing, laboratory and mill heat treating, customer's specifications. Two years as sales engineer. Three years as plant metallurgist. Desires position as metallurgist in Midwest or East. Box 3-95.

METALLURGICAL ENGINEER Master's degree. Desires position in research or teaching with excellent future and opportunity for advanced study. Two years research experience in physical metallurgy. A.E.C projects. Member Tau Beta P. Married Prefers Midwest or East Box 3-100

FORGING METALLURGIST: Graduate metallurgist with additional mechanical background. Experienced in forging alloy steels on various equipment modern heat treating methods, welding, steel mill operations, research supervision and management Midwest preferred Box 3-105

METALLOGRAPHER: Eight years experience in high-temperature alloys field. Much of time spent in examination of service failures and writing reports. Age 36, married, one child Prefers Midwest, South or West. Box 3-110

METALLURGIST: Or assistant metallurgist. Twelve years' diversified experience in physical metallurgy, heat treating, research and production, investigations, failures, metallography and physical tests. Can set up and conduct metallurgical laboratory. Considerable ferrous metallography background. Reason for changing due to termination of fellowship. Box 3-115

METALLURGIST: Of established capabilities, desires connection with moderate-sized company making a quality product requiring much skill in production, supplying an engineering market that demands continuous process and product development and intelligent sales promotion Box 3-120.

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GRADUATE METALLURGIST: Age 25; married; B.S. in metallurgy Desires to train for future responsible position in production or contact metallurgical work. Three and one-half years diversified experience involving metallography, heat treating, analytical chemistry, mechanical testing and manufacturing ferrous and nonferrous metals from casting to finished stock. Will locate anywhere. Box 3-135.

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RESEARCH CHEMIST: Age 34; broad background and experience in chemistry chemical engineering, metallurgy (ferrous and nonferrous), corrosion and ceramics. Interested in sales development or sales-research liaison work. Familiar with high-temperature metallurgy Salary open Box 3-155

METALLURGICAL ENGINEER: B.S., age 29, married. Five years' experience in welding, including research, production, field engineering. Desires position in sales — alloy or stainless steels, welding equipment Location immaterial. Box 3-160.

METALLURGIST: Age 25, married, veteran. B.S. in metallurgy. Temple University. Nine months experience as shipfitter; four years as photographer and photo-finisher. Prefers training program in any phase of metallurgy leading to responsible position. Philadelphia area preferred, but not essential. Box 3-165.

(Continued on page 47, column 1)

for production of small (1-2 lb.) Ti and Ti-alloy ingots. Fabrication of the billets into specimens suitable for determination of tensile strength, elongation, resistance to oxidation, hardness at elevated temperatures, and resistivity. Of the alloys investigated to date, those containing B, V, W, Fe, Mn-Si, and Al-Cr appear to have the highest mechanical properties. (Ti)

35-V. Hot-Shot Hybrid. *Industrial and Engineering Chemistry*, v. 42, Feb. 1950, p. 16A, 18A.

Application of metal-ceramic combinations ("cermets") for high-temperature, high-strength uses, as in gas turbines, rockets. Fabrication procedures and properties of various compositions. (SG-h)

36-V. Developments in the Iron and Steel Industry During 1949. I. E. Madsen. *Iron and Steel Engineer*, v. 27, Jan. 1950, p. 93-118.

Miscellaneous equipment developments in the blast furnace and coke plant; in steelmaking; in rolling; in finishing; in fuels and furnaces; in materials handling; and in mechanical and electrical devices. Economic data and a table listing electric motors over 300 horsepower applied to main roll drives in the iron and steel and allied industries during 1949. (Fe, ST)

37-V. Simplified Design Procedure for Helical Wire Springs. August J. Kwossek. *Product Engineering*, v. 21, Feb. 1950, p. 140-143.

Fundamental and new design equations. Mechanical-property constants for seven spring materials. (SG-b)

38-V. Recent Developments in Titanium. E. A. Gee, W. H. Van Derhoeff, and C. H. Winter, Jr. *Journal of the Electrochemical Society*, v. 97, Feb. 1950, p. 49-53.

Methods for production of ductile titanium, first by recovery of powder or sponge from the halides, followed by consolidation into workable form by iodide deposition, powder metallurgy, hot rolling, arc melting, induction melting, or resistance melting. 17 ref. (Ti)

EMPLOYMENT

(*Continued from page 46, column 3*)

METALLURGIST: B.S. Ch.E., Marquette University. Age 40, married, two children. Nine years' experience in steel foundries as chief metallurgist in charge of chemical laboratory, metallography, physical testing, melting, heat treating, sand control, customer contacts. High-frequency induction melting experience. Gray iron metallurgist with cupola operation. Progressive. Can supervise. Location open. Box 3-170.

RESEARCH OR TEACHING: In physical metallurgy. Ph.D., June 1950. Research and trouble-shooting experience in copper, aluminum and lead-base alloys, magnesium, titanium, zirconium, metal powders, single crystals and corrosion. Several papers published in U.S. and England. Three years' teaching experience. Location immaterial. Box 3-175.

HEAT TREATER: Age 25, married. Several years' experience in tool and production heat treating, backed by sound knowledge of the principles of heat treatment. Has had extensive vocational training with a keen interest in doing good heat treating. Desires position with firm that recognizes importance of heat treating. Box 3-180.

SALES ENGINEER: Age 30, B.S. Ch.E., married, one child. Effective sales personality, with 9 years' experience in sales and production. Desires position with progressive company offering better advancement opportunities and where ability will be utilized. Will relocate. Box 3-185.

STANFORD GRADUATE: B.S. in Chemical Engineering, with metallurgical courses. Desires brief employment in metallurgical plant, preferably in connection with process metallurgy. Box 3-190.

39-V. Characteristics and Technology of "Ergol" Alloys. (In Italian.) *Alluminio*, v. 18, Sept.-Oct. 1949, p. 527-553.

Chemical composition; chemical, physical, and mechanical properties; method of production; microstructure; and heat treatment of a series of alloys of the "Ergol" type (5.8% Zn, 2.5% Mg, 1.6% Cu, 0.2% Mn, 0.15% Cr, 0.1% Ti, remainder Al.) (Al)

40-V. The Multiple Uses of Platinum Metals. F. E. Carter. *Metal Progress*, v. 57, Feb. 1950, p. 194-196. (EG-c)

41-V. A New Cast Iron That Bends. *INCO Magazine*, v. 23, Winter 1950, p. 4-8.

Ductile cast iron developed by International Nickel Co., and a variety of its applications. (CI)

42-V. Copper-Base Alloys Have Wide Range of Properties. R. A. Colton. *American Foundryman*, v. 17, Feb. 1950, p. 49-54.

Various types, typical applications, and recommended foundry practices. (Cu)

43-V. The Ferro-Alloying Metals. W. H. Dennis. *Mine & Quarry Engineering*, v. 16, Feb. 1950, p. 45-52.

Ore resources, concentration and smelting methods, and applications of tungsten, chromium, titanium, ferrosilicon, and manganese. (Fe)

44-V. Nickel Steels. *Materials & Methods*, v. 31, Feb. 1950, p. 83, 85.

Miscellaneous properties, applications, heat treatment, etc., of 3½% and 5% Ni steels. (AY)

45-V. New Stainless Steel Used for Cold Headed and Upset Parts. *Materials & Methods*, v. 31, Feb. 1950, p. 59.

Workability, physical and mechanical properties of Carpenter Stainless No. 10, which contains 0.08% C (max.), 16.00% Cr, and 18.00% Ni. (SS)

Cyanamid Expands Production

The Industrial Chemicals Division of American Cyanamid Co. has announced that new production facilities for carburizing and heat treating compounds have been installed at the company's Kalamazoo, Mich., plant. Cyanamid will continue to manufacture some of these compounds at its Warners plant in Linden, N. J., but has added the new facilities in order to give efficient service to customers in the Midwest.

Opens Office in Seattle

William K. Stamets, Jr., vice-president and director of William K. Stamets Co., Pittsburgh and Cleveland machine tool manufacturing and distributing company, has opened an office in Seattle.

Mr. Stamets was formerly a naval officer engaged in ship repair and yard facilities procurement. For the past two years he was on the faculty of Cornell University, where he taught mechanical engineering. In the marine field, Mr. Stamets plans to specialize in machinery design, strain analysis and vibration control.

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